Shaw™ EMCON/OWT, Inc.

FIRST QUARTER MONITORING REPORT

JANUARY TO MARCH 2003

KIN-BUC LANDFILL OPERABLE UNITS 1 AND 2

Prepared for

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Edison Township, Middlesex County, New Jersey

April 2003

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EXECUTIVE SUMMARY

The Kin-Buc Landfill Site is a closed 200-acre industrial/commercial landfill located in Edison, New Jersey, which the USEPA placed on the National Priorities List (NPL) in 1981. A Remedial Investigation/Feasibility Study (RI/FS) was conducted between 1983 and 1988 which resulted in a Record of Decision (ROD) by USEPA in 1990 that called for source control of Operable Unit 1 (OU1).

The remedial action specified in the ROD for OU1 included the construction of a slurry wall around OU1, the collection and treatment of leachate and groundwater from within the containment area, and the capping of the area within the slurry wall. Remedial construction activities for OU1 were completed by the end of August 1995.

In accordance with the RODs, hydraulic monitoring and landfill gas monitoring is conducted on a quarterly basis to evaluate the effectiveness of the remedial actions. This report documents the results of the monitoring activities for the First Quarter of 2003.

Remedial Objectives

The general remedial objectives of the OU1 closure and collection systems are to contain source leachate and contaminated groundwater, and to prevent further migration of site-related contaminants. The primary objective of the leachate collection system is to impose an inward gradient as measured across the slurry wall in the refuse unit. The primary objectives of the groundwater collection system are to prevent migration of contaminated groundwater towards the slurry wall and impose an upward gradient from the bedrock unit to the sand & gravel unit.

Hydraulic Control and Monitoring System

The hydraulic control system for OU1 consists of leachate and groundwater collection systems. The leachate collection system consists of a perforated pipe that runs parallel to the inside of the perimeter slurry wall and 4 pump stations. The groundwater collection system consists of 4 pumping wells.

The hydraulic monitoring system for OU1 is located along the circumferential slurry wall with many of the wells located in 5 clusters, called transects. The hydraulic monitoring wells at the transects are installed in pairs, within the same hydrogeologic unit, with

1 well inside and 1 well outside the circumferential slurry wall. Twenty-four of the monitoring wells are continuously monitored using water level recorders.

The hydraulic monitoring network consists of wells screened in the refuse, sand & gravel, and bedrock units. Well designations of G, S or R; denote hydraulic units of refuse, sand & gravel or bedrock, respectively.

The OU2 hydraulic monitoring well network is located in the Low-Lying Area and Mound B, and monitors groundwater elevations outside of the OU1 containment area.

First Quarter Hydraulic Monitoring Activities

Hydraulic monitoring was performed during the period from January through March 2003.

Hydraulic monitoring indicates that intragradient conditions in the refuse unit (lower water levels in the refuse inside the wall relative to water levels outside the wall) were maintained at TL Nos. 2, 3, 4 and 5, throughout the quarter. The fact that the leachate collection system is functioning properly suggests that intragradient conditions are being maintained in the refuse unit at TL No. 1, even though review of the hydrographs does not consistently indicate this condition. Water level elevation measurements taken from Leachate Collection Cleanout Nos. 14 through 16 are included in Table 2-6, and indicate that the leachate collection system is functioning properly.

Hydraulic control was maintained within OU-1 based on the analysis of the significant influence of S&G #2 in acting as a hydraulic sink for sand and gravel and bedrock groundwater. Groundwater flow in the sand and gravel and bedrock is ultimately captured by the pumping well resulting in overall containment of groundwater in OU-1.

Leachate Withdrawal/Groundwater Pumping

The first quarter average daily groundwater extraction rate for all of the wells was 19,919 gpd. The total volume of groundwater collected for the quarter was 1,792,735 gallons. Leachate was collected at an average daily rate of 1,681 gpd for the quarter, and the total volume of leachate collected was 151,314 gallons.

Landfill Gas Monitoring

Combustible gas was not detected in any of the 6 gas monitoring wells located on the north side of OU1. Based on the non-detection of combustible gas in the monitoring wells, the active gas collection system is functioning properly and there is no apparent off-site gas migration. Monitoring at the flare inlet port by landfill personnel throughout the quarter indicated that the landfill gas collection system was delivering an average of 50 percent combustible gas to the flare.

1 INTRODUCTION

The Kin-Buc Landfill Site is a closed 200-acre industrial/commercial landfill located in Edison, New Jersey, which operated under a New Jersey Department of Environmental Protection (NJDEP) permit until 1976. The USEPA placed the Kin-Buc Landfill on the National Priorities List (NPL) in 1981. Between 1983 and 1988, the Respondents conducted a Remedial Investigation/Feasibility Study (RI/FS) which resulted in a Record of Decision (ROD) by USEPA in 1990 which called for source control of Operable Unit 1 (OU1), and an additional RI/FS to determine the nature and extent of contamination outside the source area, thus defining Operable Unit 2 (OU2).

Operable Unit 1 includes both Kin-Buc I and II Mounds, the former Pool C Area and a portion of the Low-Lying Area between Kin-Buc I and the Edison Landfill. The remedial action specified in the ROD for OU1 included the construction of a slurry wall around OU1, the collection and treatment of leachate and groundwater from within the containment area, and the capping of the area within the slurry wall.

Operable Unit 2 includes Mound B, Edmonds Creek and adjacent wetlands, the remaining Low-Lying Area between OU1 and the Edison Landfill, Martins Creek, and the Raritan River. The OU2 ROD called for the excavation and disposal of PCB-contaminated sediments from within the Edmonds Creek Marsh Area, the restoration of disturbed wetland areas, and groundwater/surface water monitoring.

Remedial construction activities for both OU1 and OU2 were completed by the end of August 1995.

In accordance with the RODs, hydraulic monitoring and landfill gas monitoring is conducted quarterly to evaluate the effectiveness of the remedial actions. This report documents the results of the monitoring activities for the First Quarter of 2003.

2 DESCRIPTION OF MONITORING PROGRAM

2.1 Hydrogeologic background

The primary hydrogeologic units within OU1 from ground surface downward are refuse, meadow mat, sand & gravel, and bedrock. Near the northern portion of the site the bedrock is closer to the surface and there is no sand & gravel unit in that area.

The southern portion of the site is located in close proximity to the Raritan River. As a result, monitoring wells located on the southern side of OU1 are impacted by tidal fluctuations.

2.2 Remedial Objectives

The general remedial objectives of the OU1 closure and collection systems are to contain source leachate and contaminated groundwater, and to prevent further migration of site-related contaminants. The specific remedial objectives for the leachate collection, groundwater collection, and hydraulic monitoring are summarized as follows:

Aqueous Leachate Collection

- Primary
  - Collect leachate from the refuse unit within the perimeter slurry wall to impose an inward gradient as measured across the slurry wall (hydraulic containment).
- Additional Benefit
  - Reduce the downward gradient between the refuse unit and the underlying sand & gravel or bedrock units.

Sand & Gravel Groundwater Collection (in Primary OU1 Containment)

- Primary
  - Prevent migration of contaminated groundwater towards the slurry wall.
  - Impose an upward gradient from the bedrock unit to the sand & gravel unit (hydraulic containment).
- Additional Benefit
  - Impose an inward gradient within the sand & gravel unit as measured across the perimeter slurry wall (hydraulic containment).

Sand & Gravel Aquifer Groundwater Collection (in Oil Seeps Area Containment)

- Collect sand & gravel groundwater from within the Oil Seeps Area if an upward gradient between the sand & gravel and the refuse units cannot be imposed by leachate collection alone.

2.3 Hydraulic Control and Monitoring System

The hydraulic control system for OU1 consists of 4 leachate pump stations and 4 sand & gravel groundwater pumping wells. The leachate collection system consists of a perforated pipe that runs parallel to the inside of the perimeter slurry wall. In addition, a corrugated oily leachate collection conduit is located along the south side of Kin-Buc I mound. The layout of the collection system is shown on Drawing 1.

The hydraulic monitoring system for Operable Unit 1 is located along the circumferential slurry wall with many of the wells located in 5 clusters, called transects. The OU1 hydraulic monitoring well network consists of 11 wells screened in the refuse/fill, 8 wells screened in the sand & gravel, and 10 wells screened within bedrock. A summary of the well network is provided in Table 2-1, and the well locations are shown on Drawing 1.

The hydraulic monitoring wells at the transects are installed in pairs, within the same hydrogeologic unit, with 1 well inside and 1 well outside the circumferential slurry wall. The design of the well network allows groundwater elevations to be monitored on either side of the slurry wall and provides data to evaluate the performance of the slurry wall as a hydraulic barrier.

At TL Nos. 2, 3 and 4, the hydraulic monitoring wells are installed in the refuse, sand & gravel, and bedrock units. At TL Nos. 1 and 5, the hydraulic monitoring wells are installed only in the refuse and bedrock units due to the absence of sand and gravel deposits in these areas. Well designations of G, S and R, denote hydraulic units of refuse, sand & gravel, and bedrock, respectively.

The OU2 hydraulic monitoring well network is located in the Low-Lying Area and Mound B, and monitors groundwater elevations outside of the OU1 containment area. The hydraulic monitoring system for OU2 consists of 16 wells, as indicated in Table 2-2 and as shown on Figure 1-1. Water elevation measurements from the OU2 wells are taken manually, concurrent with the OU1 monitoring activities.

2.4 First Quarter Hydraulic Monitoring Activities

Hydraulic monitoring for the First Quarter of 2003 (January to March) took place according to the procedures and methods outlined in the Draft Operations and Maintenance (O&M) Manual for the Kin-Buc Landfill, prepared on behalf of the Respondents by Wheelabrator EOS in September 1995 and modified by a letter to EPA dated February 28, 1996.

Components of the hydraulic monitoring program consist of continuous and manual water level measurements. Manual measurements were obtained with an electronic water level indicator. Continuous water levels were obtained at 1-hour intervals using 24 In-Situ "miniTROLL", Model SSP-100 data loggers and transducers.

Several maintenance activities were performed on the miniTROLLS throughout the quarter. Alkaline batteries were replaced with lithium batteries in each of the miniTROLLS. Glenn Carlson, an In-Situ Inc. representative, recommended the batteries be changed to lithium batteries. The lithium batteries last two to three times longer than the alkaline batteries and can withstand the cold temperatures (down to -40°F). There were complications when attempting to communicate and retrieve data from two of the miniTrolls this quarter. These problems occurred with the miniTroll at Well 5R, during the January downloads, and at Well 15G, during the March downloads. Although the continuous water level data is not available for those time periods, manual water levels were taken. The EMCON/OWT field technician was able to restart the test for the miniTroll in Well 5R and a SP4000 Troll is currently being used to collect data at Well 15G. Also, In-Situ, Inc. repaired the miniTROLL that had malfunctioned in Well 13G (serial number 6171) and this unit was installed during the site visit on April 1, 2003. The SP4000 Troll that was in Well 13G is the one currently collecting data at Well 15G until the dedicated miniTroll is repaired. Information regarding maintenance of the miniTROLLS can also be found in the attached Hydraulic Monitoring Reports for each month (Appendix B).

Three months of continuous water level data have been obtained from the refuse and sand & gravel wells at the site from January 1, 2003 to March 31, 2003. The minimum, maximum, and average recorded water elevations for each month in the quarter are provided in Table 2-4. Continuous groundwater elevation graphs organized by transect location and hydrogeologic unit are provided in Appendix A. Evaluations of the recorded data are performed on a monthly basis and sent to Waste Management. Copies of these monthly evaluations are provided in Appendix B.

Manual groundwater elevation measurements were obtained from the monitoring wells in OU1 and OU2 during site visits on January 2, 2003, February 12 & 14, 2003, and March 3 & 4, 2003. The manually recorded water level monitoring results are provided in Table 2-3.

2.5 Continuous Hydraulic Monitoring Results vs. Manual Elevation Measurements

The continuous water level monitoring information collected by the Trolls was compared with the data collected from the manual recordings to provide information on the relative accuracy of manual versus automatic recordings. Table 2-5 shows the difference between the manual water level elevation measurements and Troll recordings for the same day and hour. The average differences between the manual and continuous measurements were at or below 0.21 feet for all wells. Based on the comparison above, the data recorded by the Trolls is satisfactory and reflects accurate groundwater elevations.

3 HYDRAULIC MONITORING

The following presents an evaluation of the results of hydraulic monitoring performed during the first quarter 2003.

3.1 Assessment of Hydraulic Conditions in the Refuse Unit

As defined in the Record of Decision (ROD) for OU-1, the performance objective for the refuse unit calls for the pumping of leachate to establish inward gradients across the slurry wall with the additional benefit of reducing downward flow into the underlying sand and gravel unit. Based on the hydrographs the following is presented.

TL No. 1 (Well 1G/Well 2G) – Hydrograph No. 1

Intragradient conditions were not consistently observed throughout the quarter. The average quarterly water elevations for Wells 1G (inside) and 2G (outside) were 11.24 and 11.84 feet msl, respectively. The average head elevation difference between the two wells was approximately 0.6 feet in an inward direction. High water levels in Well 1G have been observed on several previous occasions and may be related to localized conditions around the well.

Water level elevation measurements taken from Leachate Collection Cleanout Nos. 14 through 16 are included in Table 2-6, and indicate that the leachate collection system is functioning properly. The water level elevations observed for Leachate Collection Cleanouts 14 through 15 are all between 9.29 and 9.97 feet msl, and the water level elevations for Cleanouts 16N and 16E were dry (less than the cleanouts invert elevation). This indicates that groundwater flow at this location is from the inside to the Leachate Collection Cleanouts. The leachate collection system is therefore functioning properly and suggests significant capture of leachate. Appendix B (Monthly Hydraulic Evaluations) provides an analysis of the hydraulic performance at Transect 1.

TL No. 2 (Well 3G/Well 4G) – Hydrograph No. 2

Intragradient conditions were maintained at TL No. 2 in the refuse unit throughout the quarter. The average quarterly water elevations for Wells 3G (inside) and 4G (outside) were 7.99 and 11.62 feet msl, respectively. The average head elevation difference between the two wells was approximately 3.63 feet in an inward direction.

TL No. 3 (Well 5G/Well 6G) – Hydrograph No. 3

Intragradient conditions were maintained at TL No. 3 in the refuse unit throughout the quarter. The average quarterly water elevations for Wells 5G (inside) and 6G (outside) were 9.76 and 13.63 feet msl, respectively. The head elevation difference between the two wells was approximately 3.87 feet in an inward direction.

TL No. 4 Well 15G/Well 13G) Oil Seeps Area – Hydrograph No. 4

Intragradient conditions were maintained at TL No. 4, Oil Seeps Area, in the refuse unit throughout the months of January and February (data not available for Well 15G for March due to mechanical problems). The average quarterly water elevations for Wells 15G (inside) and 13G (outside) were 1.46 and 3.78 feet msl, respectively. The head elevation difference between the two wells was approximately 2.32 feet in an inward direction.

TL No. 5 (Well 9G/Well 10G) – Hydrograph No. 5

Intragradient conditions were maintained at TL No. 5 in the refuse unit throughout the quarter. The average quarterly water elevations for Wells 9G (inside) and 10G (outside) were 7.11 and 8.06 feet msl, respectively. The average head elevation difference between the two wells was approximately 0.95 feet in an inward direction.

3.2 Assessment of Hydraulic Conditions in the Sand & Gravel Unit

For the sand and gravel unit, the performance objectives call for pumping of sand and gravel groundwater to prevent flow toward the slurry wall and to impose upward hydraulic gradients from the bedrock to the sand and gravel. An additional benefit would be the establishment of inward gradients across the slurry wall within the sand and gravel unit. The following is a description of the flow characteristics based on visual observation of the hydrographs.

Horizontal Flow

TL No. 2 (Well 3S/Well 4S) – Hydrograph No. 6

Although intragradient conditions were not consistently observed throughout the quarter, it is evident that containment is being maintained by pumping wells SG-2 and SG-3 (as described below in Section 3.2.1). The average quarterly water elevations for Wells 3S (inside) and 4S (outside) were 0.41 and 0.58 feet msl, respectively. The average head elevation difference between the two wells was approximately 0.17 feet in an inward direction.

TL No. 3 (Well 5S/Well 6S) – Hydrograph No. 7

Slight intragradient conditions were maintained at TL No. 3 in the sand & gravel unit throughout the quarter. The average quarterly water elevation for Wells 5S (inside) and 6S (outside) were 1.27 and 1.37 feet msl, respectively. The head elevation difference between the two wells was approximately 0.1 feet in an inward direction.

TL No. 4 (Well 7S/Well 8S) – Hydrograph No. 8

Intragradient conditions were maintained at TL No. 4 in the sand & gravel unit throughout the quarter. The average quarterly water elevation for Wells 7S (inside) and 8S (outside) was 1.50 and 2.35 feet msl, respectively. The head elevation difference between the two wells was approximately 0.85 feet in an inward direction.

TL No. 4 (Well 15S/Well 13S) Oil Seeps Area – Hydrograph No. 9

Intragradient conditions are being maintained by pumping wells SG-2 and SG-3 although these conditions were not evident by the head elevations for the quarter (see Section 3.2.1). The average quarterly water elevations for Wells 15S (inside) and 13S (outside) were 2.25 and 1.99 feet msl, respectively. The head elevation difference between the two wells was approximately 0.26 feet in an outward direction. Water levels from Well 15G are included in the hydrograph for comparison.

<u>Vertical Flow</u>

TL No. 2 (Well 3S/Well 3RR) – Inside; (Well 4S/Well 4R) – Outside
Hydrograph Nos. 10 and 11

Although upward gradient conditions were not consistently observed between the bedrock and overlying sand & gravel units inside the slurry wall at TL No. 2 throughout the quarter, containment is still maintained by pumping wells SG-2 and SG-3 (see Section 3.2.1). The average quarterly water elevation for Well 3S (sand & gravel) and 3RR (bedrock) was 0.41 and 0.28 feet msl, respectively. The difference in average quarterly water elevations was approximately 0.13 feet in a downward direction.

Containment is being maintained by pumping wells SG-2 and SG-3 even though the elevations do not reflect upward gradient conditions between the bedrock and overlying sand & gravel units outside the slurry wall (see Section 3.2.1). The average quarterly water elevation for Wells 4S (sand & gravel) and 4R (bedrock) was 0.58 and 0.43 feet msl, respectively. The difference in average quarterly water elevations was 0.15 feet in an downward direction.

TL No. 3 (Well 5S/Well 5R) – Inside; (Well 6S/Well 6R) – Outside
Hydrograph Nos. 12 and 13

Inside the slurry wall at TL No. 3, slight upward gradient conditions were observed between the bedrock and overlying sand & gravel units throughout the second half of February and the month of March (there is no continuous water level data for Well 5R for 1/1-2/14 due to mechanical problems). The average quarterly water elevations for Wells 5S (sand & gravel) and 5R (bedrock) were 1.27 and 1.19 feet msl, respectively. The difference in average quarterly water elevations was less than 0.1 feet.

Outside the slurry wall at TL No. 3, upward gradient conditions were observed between the bedrock and overlying sand & gravel units. The average quarterly water elevations for wells 6S (sand & gravel) and 6R (bedrock) were 1.37 and 1.52, respectively. The difference in average quarterly water elevations was 0.15 feet.

TL No. 4 (Well 7S/Well 7R) – Inside; (Well 8S/Well 8RR) – Outside
Hydrograph Nos. 14 and 15

Slight upward gradient conditions were maintained between the bedrock and overlying sand & gravel units inside the slurry wall at TL No. 4 throughout the quarter. The average quarterly water elevations for Wells 7S (sand & gravel) and 7R (bedrock) were 1.50 and 1.57 feet msl, respectively. The difference in average quarterly water elevations was 0.07 feet.

Outside the slurry wall at TL No. 4, containment was achieved through pumping wells SG-2 and SG-3 although the elevations do not reflect upward gradient conditions between the bedrock and overlying sand & gravel units (see Section 3.2.1). Since the average water elevations are so close, a dominant flow direction cannot be established. The average quarterly water elevations for Wells 8S (sand & gravel) and 8RR (bedrock) were 2.35 feet and 2.30 feet msl, respectively. The difference in average quarterly water elevations was 0.05 feet.

3.2.1 Analysis

While initial review of the hydrographs indicate that certain performance objectives may not be met, (uniform achievement of upward gradients from the bedrock to the sand and gravel, and inward gradients across the slurry wall) containment is still maintained by the pumping wells SG-2 and SG-3. Figures 1 through 4 (See Appendix B) depict horizontal or vertical flow vectors within the sand and gravel or bedrock units. These diagrams show that although downward groundwater flow from the sand and gravel to the bedrock may occur locally within the slurry wall, the zone of influence of the pumping wells includes the sand and gravel units and the upper portion of the bedrock within the slurry wall. Regardless of whether groundwater is flowing vertically upward or downward within the slurry wall in the sand and gravel and upper bedrock, it will eventually migrate toward the pumping wells, and will be captured. Examination of the pumping results for this quarter indicates that this process is more efficient if SG-3 is pumped in conjunction with SG-2.

3.3 OU2 Hydraulic Monitoring

The synoptic groundwater elevations obtained during the First Quarter of 2003 indicate both upward and downward hydraulic gradients.

4 LEACHATE WITHDRAWAL/GROUNDWATER PUMPING

The performance of the site hydraulic controls is largely dependent upon groundwater pumping and leachate withdrawal rates. The design aqueous leachate and groundwater (GW) collection rates called for a ratio of 3:1, groundwater to leachate of 30,000 gpd groundwater, and 10,000 gpd leachate. The collection rates differed from the design rates due to variations between design assumptions and actual site conditions. Collection rates are also adjusted based on changing site and operational conditions.

Operation records are maintained at the site and contain estimated daily averages for leachate and groundwater withdrawal. The monthly volumes collected and the daily average collection rate are provided below:

Monitoring Period	Groundwater S&G No. 1	Groundwater S&G No. 2	Groundwater S&G No. 3	Groundwater S&G No. 4	Leachate
January	0 gal.	568,574 gal.	105,964 gal.	0 gal.	60,927 gal.
	0 gpd	18,341 gpd	3,418 gpd	0 gpd	1,965 gpd
February	0 gal.	557,504 gal.	60,604 gal.	8,370 gal.	43,343 gal.
	0 gpd	19,911 gpd	2,164 gpd	299 gpd	1,548 gpd
March	0 gal.	368,694 gal.	118,399 gal.	4,626 gal.	47,044 gal.
	0 gpd	11,893 gpd	3,819 gpd	149 gpd	1,517 gpd
Quarter	**0 gal.**	**1,494,772 gal.**	**284,967 gal.**	**12,966 gal.**	**151,314 gal.**
	0 gpd	**16,609 gpd**	**3,166 gpd**	**144 gpd**	**1,681 gpd**

The volume of groundwater collected in the first quarter is 1,792,735 gallons. The average daily groundwater withdrawal rate for the first quarter is 19,919 gpd.

5 LANDFILL GAS MIGRATION MONITORING

Landfill gas migration monitoring was performed at the operational flare port inlet and the 6 gas migration monitoring wells located along the northern edge of the landfill boundary.

5.1 Landfill Gas Migration

The purpose of the gas migration monitoring program is to monitor for off-site gas migration in those areas where gas migration or accumulation could lead to explosive conditions. Six gas migration monitoring wells are located outside of the circumferential slurry wall along the northern edge of the landfill boundary. The well locations are depicted on Drawing 1 and are spaced in 200-foot increments.

All areas of OU1 exterior to the slurry wall contain waste materials except along the northern edge of the landfill boundary. High levels of gas are not expected to be detected along the northern boundary because the slurry wall will act as an effective barrier, and the presence of an active gas extraction system and the high water table will inhibit gas migration.

Gas monitoring in other areas of the site containing waste materials will likely reveal combustible gas. However, since no on-site OU1 buildings are present (except the leachate treatment facility, which has its own engineered gas monitoring and control system), gas migration monitoring in the waste areas is not required by the O&M manual.

5.2 Gas Monitoring Well Results

Measurements of percent combustible gas (% GAS) and percent lower explosive limit (% LEL) were performed in the 6 gas migration monitoring wells along the northern boundary of the site on March 4, 2003. The wells were monitored in accordance with Attachment 1, Section 3.0 - Routine Operations and Maintenance of the Kin-Buc Landfill Draft O&M Manual (Wheelabrator, 1995). A Landtec GEM 500 sampling device was used to measure the concentration of combustible gas at each well by attaching the meter's sample tubing to the well head petcock and drawing the sample through the meter. Detectable levels of percent combustible gas and percent lower explosive limit were not observed in any gas monitoring wells. The results for the 6 gas migration monitoring wells are shown in Table 5-1.

5.3 Operational Flare Monitoring Results

The percent combustible gas by volume (% methane) at the landfill's operational flare port inlet was recorded throughout the first quarter of 2003. All readings were collected with a Landtec GEM 500 Gas Analyzer, equipped with a charcoal filter. Monitoring performed on March 4, 2003 revealed combustible gas at 54 percent at the flare port inlet.

The following summarizes the flare station operation during the First Quarter of 2003:

Date	Gas Flow (SCFM)	Methane % by volume
1/13/03	131	49.4
1/27/03	102	53.2
2/07/03	132	47.1
2/26/03	121	41.9
3/10/03	118	52.0
3/25/03	120	56.5
Averages for Third Quarter	121	50

Note: Flare station data provided by Landfill personnel.

6 CONCLUSIONS

Significant conclusions for the First Quarter of 2003 monitoring program are as follows:

- In the refuse unit, intragradient conditions were maintained over the entire quarter at Transects 2, 3, 4, and 5. An average daily leachate extraction rate of 1,681 gpd was collected.
- Intragradient conditions were not indicated by the monitoring wells in the refuse unit at Transect 1, although levels in the leachate collection system indicate intragradient conditions are present at this location.
- Hydraulic control was maintained within OU-1 based on the analysis of the significant influence of S&G#2 and S&G#3 in acting as a hydraulic sink for sand and gravel and bedrock groundwater. Groundwater flow in the sand and gravel and bedrock is ultimately captured by the pumping well resulting in overall containment of groundwater in OU-1.
- In view of the analysis presented herein, it is recommended that the combined groundwater pumping rates in the sand and gravel be maintained at 15,000 gpd with S&G#2 and S&G#3 pumping at 10,000 gpd and 5,000 gpd, respectively. These lower pumping rates will be evaluated to confirm continued hydraulic control of OU-1 groundwater.
- Maintaining a leachate collection rate of 1,500 gpd is recommended.
- Combustible gas as a percent of total gas and the lower explosive limit was not detected in the 6 monitoring wells located on the northern boundary of the site. The flare was operational and the average percent methane for the quarter at the flare port inlet was 50 percent. Based on the non-detection of combustible gas in the monitoring wells, the active gas collection system is functioning properly and there is no off-site gas migration.

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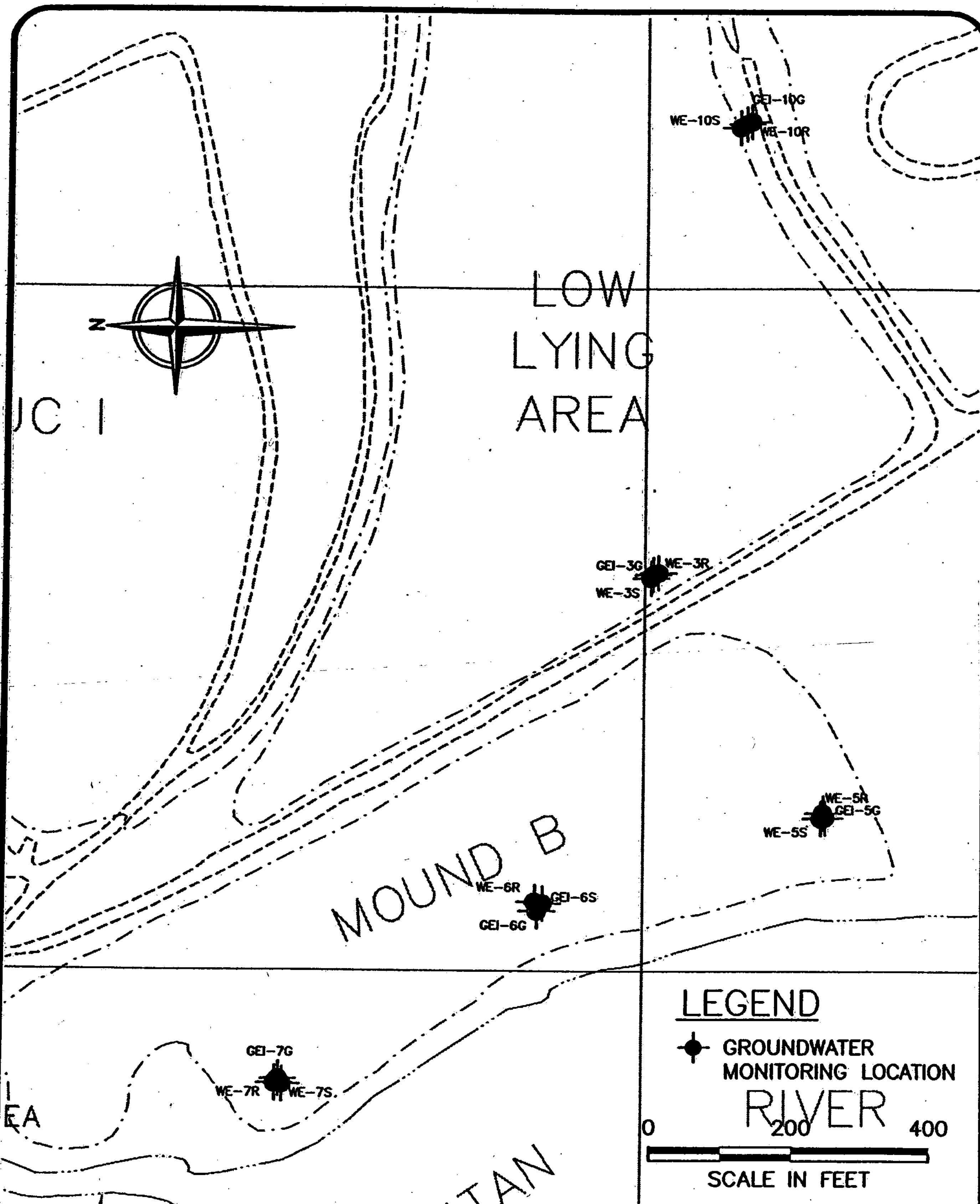
Figure



EMCON

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FIGURE 1-1
KINBUC LANDFILL

EDISON TOWNSHIP, NEW JERSEY
OU2 GROUNDWATER
MONITORING LOCATIONS

ENE-MTOWN2/DATA: N:\DWG\12568001\MAKBF-01.dwg Xrefs: MAKBWE01, MAKBTW01, MAKBBD01
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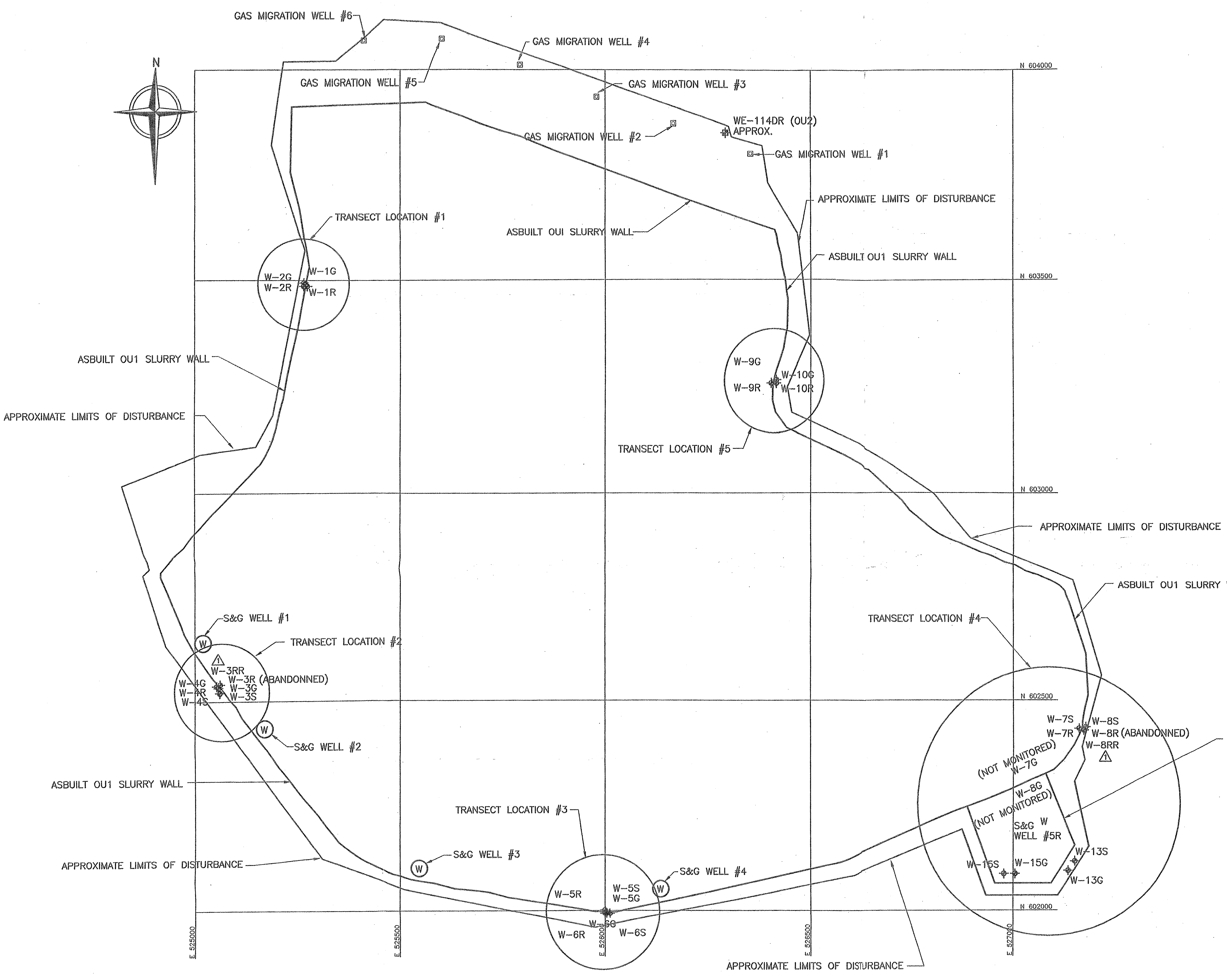
Drawing



LEGEND

- NEW MONITORING WELLS
- (W) NEW SAND & GRAVEL PUMPING WELLS
- NEW GAS MIGRATION WELLS
- OU2 UPGRADIENT MONITORING BEDROCK WELL (APPROXIMATE LOCATION)

SOURCE: BASEMAP DATA TAKEN FROM PLAN SHEET 10A OF MAP ENTITLED "KINBUC LANDFILL FINAL WELL LOCATION PLAN" PREPARED BY CONTI ENVIRONMENTAL INC. DATED JULY 17, 1995.

NOTES:
1. THE MONITORING WELL LOCATIONS W-7G, W-8G, W-13G, W-13S, W-15G, AND W-15S ARE APPROXIMATE.
2. MONITORING WELL W-8R IS DAMAGED AND NOT SERVICABLE AS A WATER QUALITY MONITORING POINT.
3. MONITORING WELLS W-7G AND W-8G REPLACED BY W-15G AND W-13G.
4. MONITORING WELLS W-8R AND W-3R ABANDONED AND REPLACED BY NEW MONITORING WELLS W-8RR AND W-3RR RESPECTIVELY.

REV	DATE	DESCRIPTION	DWN BY	DES BY	CHK BY	APP BY
1	2/99	ADD NEW WELLS				

DATE OF ISSUE 5/96 — DWN BY SDT — DES BY RB — CHK BY — APP BY

Shaw™ EMCON/OWT, Inc.

KIN-BUC LANDFILL
EXISTING GROUNDWATER MONITORING PLAN
EDISON TOWNSHIP, NEW JERSEY

OPERABLE UNIT 1 MONITORING NETWORK

DRAWING NO. 1

PROJECT NO. 01862-025.000

TABLES

Table 2-1

Kin-Buc Landfill
Operable Unit 1
Continuous Hydraulic Monitoring Well Network/Transects

Transect Location No.	Screened Hydrogeologic Unit	Well Location Inside Slurry Wall	Well Location Outside Slurry Wall
1	Refuse/Fill	W-1G	W-2G
2	Refuse/Fill	W-3G	W-4G
	Sand and Gravel	W-3S	W-4S
	Bedrock	W-3RR	W-4R
3	Refuse/Fill	W-5G	W-6G
	Sand and Gravel	W-5S	W-6S
	Bedrock	W-5R	W-6R
4	Refuse/Fill(1)	W-15G	W-13G
	Sand and Gravel(1)	W-15S	W-13S
	Sand and Gravel(2)	W-7S	W-8S
	Bedrock (2)	W-7R	W-8RR
5	Refuse/Fill	W-9G	W-10G

Notes: (1) Wells located across the extended slurry wall.
(2) Wells located across the OU1 circumferential slurry wall.

Table 2-2

Kin-Buc Landfill
Operable Unit 2
Hydraulic Monitoring Network

Well Location	Screened Hydrogeologic Unit
Low-Lying Area	
GEI-10G	Fill/Refuse
WE-10S	Sand & Gravel
WE-10R	Bedrock
GEI-3G	Fill/Refuse
WE-3S	Sand & Gravel
WE-3R	Bedrock
Mound B	
GEI-5G	Fill/Refuse
WE-5S	Sand & Gravel
WE-5R	Bedrock
GEI-6G	Fill/Refuse
GEI-6S	Sand & Gravel
WE-6R	Bedrock
GEI-7G	Fill/Refuse
WE-7S	Sand & Gravel
WE-7R	Bedrock
Upgradient	
WE-114DR	Bedrock

Table 2-3
KinBuc Landfill Operable Units 1 and 2
Modified Monitoring Program
First Quarter 2003
Manually Recorded Water Level Elevations

Well ID	TOC Bottom	TOC Ref Elevation	January 2, 2003		February 12-14, 2003		March 3-4, 2003	
			TOC Static	Elevation	TOC Static	Elevation	TOC Static	Elevation
OU1								
W-1G	20.50	30.78	19.51	11.27	19.53	11.25	19.52	11.26
W-1R	35.34	30.79	20.60	10.19	20.70	10.09	20.94	9.85
W-2G	20.38	30.77	17.46	13.31	19.92	10.85	18.92	11.85
W-2R	35.33	30.64	23.46	7.18	24.02	6.62	23.91	6.73
W-3G (oil)	19.07	20.73	11.02	9.71	11.02	9.71	11.07	9.66
W-3G	19.07	20.73	12.81	7.92	12.85	7.88	12.87	7.86
W-3S	31.48	20.79	19.59	1.20	20.83	-0.04	20.39	0.40
W-3RR	54.40	21.16	19.71	1.45	21.77	-0.61	21.01	0.15
W-4G	17.57	20.23	9.05	11.18	9.09	11.14	8.87	11.36
W-4S	31.58	19.71	17.17	2.54	20.29	-0.58	19.02	0.69
W-4R	54.92	20.61	18.24	2.37	21.45	-0.84	20.10	0.51
W-5G	24.36	23.94	14.12	9.82	14.09	9.85	14.29	9.65
W-5S	30.33	24.33	22.12	2.21	23.45	0.88	23.15	1.18
W-5R	41.64	24.11	22.03	2.08	23.37	0.74	23.04	1.07
W-6G	23.99	23.69	10.06	13.63	10.24	13.45	9.99	13.70
W-6S	38.49	24.00	21.60	2.40	23.06	0.94	22.61	1.39
W-6R	50.43	23.99	21.51	2.48	22.93	1.06	22.53	1.46
W-7G	19.91	18.30	8.60	9.70	8.84	9.46	8.81	9.49
W-7S	29.34	11.61	12.98	-1.37	11.09	0.52	10.08	1.53
W-7R	45.13	11.05	12.61	-1.56	10.44	0.61	9.42	1.63
W-8S	28.86	10.92	8.32	2.60	9.31	1.61	8.88	2.04
W-8RR	41.60	9.51	6.97	2.54	7.94	1.57	7.45	2.06
W-9G	21.93	27.34	19.98	7.36	20.32	7.02	20.38	6.96
W-9R	39.05	27.68	21.14	6.54	21.59	6.09	21.62	6.06
W-10G	22.56	27.43	19.39	8.04	19.56	7.87	19.51	7.92
W-10R	34.01	27.43	19.41	8.02	19.86	7.57	19.82	7.61
W-13G	10.30	10.17	3.35	6.82	3.87	6.30	3.48	6.69
W-13S	29.32	10.10	7.66	2.44	8.95	1.15	7.94	2.16
W-15G(1)	16.99	16.18	14.67	1.51	14.76	1.42	14.76	1.42
W-15S	33.36	16.05	13.36	2.69	14.89	1.16	14.08	1.97
OU2								
GEI-10G	13.91	13.65	0.81	12.84	1.22	12.43	0.66	12.99
WE-10S	29.57	14.99	12.83	2.16	14.69	0.30	13.75	1.24
WE-10R	41.74	13.96	11.79	2.17	13.64	0.32	12.68	1.28
GEI-3G	13.54	16.73	3.82	12.91	4.42	12.31	3.68	13.05
WE-3S	25.67	15.12	12.98	2.14	15.35	-0.23	14.20	0.92
WE-3R	46.51	14.99	12.65	2.34	15.94	-0.95	14.79	0.20
GEI-5G	14.60	16.08	10.05	6.03	9.78	6.30	9.71	6.37
WE-5S	25.84	15.04	12.43	2.61	16.05	-1.01	14.95	0.09
WE-5R	49.64	15.31	12.81	2.50	16.49	-1.18	15.39	-0.08
GEI-6G	14.97	19.76	11.80	7.96	11.93	7.83	11.84	7.92
GEI-6S	43.67	20.99	18.28	2.71	22.95	-1.96	21.83	-0.84
WE-6R	47.12	19.62	17.17	2.45	21.93	-2.31	20.74	-1.12
GEI-7G	13.74	17.23	dry	<3.49	dry	<3.49	dry	<3.49
WE-7S	30.07	15.86	12.98	2.88	18.38	-2.52	16.01	-0.15
WE-7R	72.88	15.93	12.61	3.32	17.01	-1.08	15.61	0.32
WE-114DR	44.84	23.76	17.56	6.20	18.24	5.52	18.24	5.52

NOTE:
(1) All level, reference, bottom measurements recorded to the top of PVC inner casing.

Table 2-4
KinBuc Landfill Operable Units 1 and 2
Continuous Hydraulic Monitoring Results
First Quarter 2003
Minimum/Maximum/Average Water Elevations

Inside Slurry Wall					Outside Slurry Wall				
Well ID	Monitoring Period	Minimum Recorded Water Elevation (ft)	Maximum Recorded Water Elevation (ft)	Average Water Elevation (ft)	Well ID	Monitoring Period	Minimum Recorded Water Elevation (ft)	Maximum Recorded Water Elevation (ft)	Average Water Elevation (ft)
W-1G	January	11.20	11.24	11.22	W-2G	January	11.31	13.87	12.31
	February	11.23	11.28	11.25		February	10.49	11.93	11.06
	March	11.23	11.34	11.24		March	11.85	12.42	12.15
	1st Quarter	11.20	11.34	11.24		1st Quarter	10.49	13.87	11.84
W-3G	January	7.78	8.53	8.06	W-4G	January	11.16	12.23	11.57
	February	7.43	8.37	7.89		February	10.98	12.02	11.41
	March	7.61	8.31	7.99		March	11.57	12.13	11.88
	1st Quarter	7.43	8.53	7.99		1st Quarter	10.98	12.23	11.62
W-3S	January	-0.56	1.77	0.46	W-4S	January	-1.23	3.08	0.52
	February	-3.25	1.52	-0.03		February	-1.40	2.22	0.27
	March	0.12	1.58	0.84		March	-0.22	2.64	0.99
	1st Quarter	-3.25	1.77	0.41		1st Quarter	-1.40	3.08	0.58
W-5G	January	9.55	10.33	9.83	W-6G	January	13.10	14.27	13.54
	February	9.29	10.17	9.72		February	12.85	14.31	13.47
	March	9.41	10.09	9.73		March	13.31	14.44	13.87
	1st Quarter	9.29	10.33	9.76		1st Quarter	12.85	14.44	13.63
W-5S	January	0.35	2.76	1.27	W-6S	January	0.46	2.90	1.37
	February	-0.16	2.13	0.92		February	-0.04	2.26	1.03
	March	0.95	2.45	1.58		March	1.04	2.59	1.69
	1st Quarter	-0.16	2.76	1.27		1st Quarter	-0.04	2.90	1.37
W-7S	January	0.76	2.81	1.53	W-8S	January	1.71	5.70	2.37
	February	0.20	2.19	1.17		February	1.39	4.21	2.12
	March	1.22	2.53	1.77		March	-3.53	4.72	2.52
	1st Quarter	0.20	2.81	1.50		1st Quarter	-3.53	5.70	2.35
W-15S	January	2.00	4.02	2.94	W-13S	January	1.28	4.08	2.00
	February	0.64	3.11	2.00		February	0.93	2.98	1.72
	March	-0.24	3.29	1.80		March	1.70	3.62	2.22
	1st Quarter	-0.24	4.02	2.25		1st Quarter	0.93	4.08	1.99
W-15G	January	1.34	1.63	1.46	W-13G	January	3.04	4.24	3.77
	February	1.29	1.61	1.45		February	3.36	4.30	3.71
	March	NA [1]	NA [1]	1.46 [2]		March	3.64	4.16	3.85
	1st Quarter	1.29	1.63	1.46		1st Quarter	3.04	4.30	3.78
W-9G	January	6.87	7.71	7.29	W-10G	January	8.03	8.33	8.20
	February	6.74	7.14	6.92		February	7.79	8.05	7.92
	March	6.84	7.34	7.11		March	7.86	8.21	8.03
	1st Quarter	6.74	7.71	7.11		1st Quarter	7.79	8.33	8.06
W-3RR	January	-0.95	2.24	0.28	W-4R	January	-1.46	3.02	0.41
	February	-1.58	1.93	-0.06		February	-1.69	2.18	0.13
	March	-0.38	1.93	0.66		March	-0.56	2.54	0.80
	1st Quarter	-1.58	2.24	0.28		1st Quarter	-1.69	3.02	0.43

Table 2-4
KinBuc Landfill Operable Units 1 and 2
Continuous Hydraulic Monitoring Results
First Quarter 2003
Minimum/Maximum/Average Water Elevations

Inside Slurry Wall					Outside Slurry Wall				
Well ID	Monitoring Period	Minimum Recorded Water Elevation (ft)	Maximum Recorded Water Elevation (ft)	Average Water Elevation (ft)	Well ID	Monitoring Period	Minimum Recorded Water Elevation (ft)	Maximum Recorded Water Elevation (ft)	Average Water Elevation (ft)
W-5R	January	NA (1)	NA (1)	0.74 (2)	W-6R	January	0.66	3.04	1.53
	February	-0.04 (3)	2.29 (3)	1.08 (3)		February	0.11	2.40	1.18
	March	1.12	2.61	1.76		March	1.20	2.70	1.82
	1st Quarter	-0.04	2.61	1.19		1st Quarter	0.11	3.04	1.52
W-7R	January	0.83	2.86	1.60	W-8RR	January	1.67	5.64	2.34
	February	-1.26	2.24	1.23		February	1.38	4.17	2.10
	March	1.29	2.59	1.84		March	1.91	4.65	2.46
	1st Quarter	-1.26	2.86	1.57		1st Quarter	1.38	5.64	2.30

Notes:
(1) Troll malfunctioned, data was not collected.
(2) Water elevation calculated from manual water levels.
(3) Water elevation data is from 2/14 - 2/28.

Table 2-5
KinBuc Landfill Operable Unit 1
First Quarter 2003
Troll Water Elevations vs. Manual Water Elevations

OU 1 Well ID	February 12-14, 2003			March 3-4, 2003			April 1, 2003			Average
	Troll	Manual	Difference	Troll	Manual	Difference	Troll	Manual	Difference	Difference
W-1G	11.26	11.25	0.01	11.27	11.26	0.01	11.24	11.27	0.03	0.02
W-2G	10.84	10.85	0.01	11.86	11.85	0.01	12.04	12.06	0.02	0.01
W-3G	7.93	7.88	0.05	7.82	7.82	0.00	7.97	7.73	0.24	0.10
W-3S	-0.04	-0.04	0.00	0.36	0.40	0.04	0.66	0.64	0.02	0.02
W-3RR	-0.61	-0.61	0.00	0.17	0.15	0.02	0.54	0.65	0.11	0.04
W-4G	11.15	11.14	0.01	11.69	11.36	0.33	11.93	11.63	0.30	0.21
W-4S	-0.53	-0.58	0.05	0.69	0.69	0.00	1.04	1.07	0.03	0.03
W-4R	-0.77	-0.84	0.07	0.41	0.51	0.10	0.92	1.07	0.15	0.11
W-5G	9.78	9.85	0.07	9.59	9.65	0.06	9.72	9.82	0.10	0.08
W-5S	0.87	0.88	0.01	1.14	1.18	0.04	1.44	1.48	0.04	0.03
W-5R	0.71	0.74	0.03	1.06	1.07	0.01	1.39	1.43	0.04	0.03
W-6G	13.43	13.45	0.02	13.70	13.70	0.00	13.65	13.67	0.02	0.01
W-6S	0.90	0.94	0.04	1.34	1.35	0.01	1.56	1.62	0.06	0.04
W-6R	1.05	1.06	0.01	1.44	1.45	0.01	1.62	1.66	0.04	0.02
W-7S	0.52	0.52	0.00	1.51	1.53	0.02	1.70	1.73	0.03	0.02
W-7R	0.62	0.61	0.01	1.59	1.59	0.00	1.79	1.81	0.02	0.01
W-8S	1.61	1.61	0.00	2.07	2.04	0.03	2.35	2.35	0.00	0.01
W-8RR	1.59	1.57	0.02	2.12	2.07	0.05	2.30	2.28	0.02	0.03
W-9G	7.00	7.02	0.02	6.99	6.96	0.03	7.29	7.26	0.03	0.03
W-10G	7.95	7.87	0.08	7.90	7.91	0.01	8.22	8.26	0.04	0.04
W-13G	6.39	6.30	0.09	6.60	6.69	0.09	6.81	6.84	0.03	0.07
W-13S	1.15	1.15	0.00	2.14	2.15	0.01	2.06	2.11	0.05	0.02
W-15G	1.42	1.42	0.00	1.42	1.42	0.00	NA (1)	1.46	NA (1)	0.00
W-15S	1.14	1.16	0.02	1.91	1.95	0.04	2.18	2.21	0.03	0.03

Notes : (1) Troll data was not collected due to device malfunction. Water levels taken manually.

Table 2-6
Kin-Buc Landfill
Leachate Cleanout Monitoring
2003

Cleanout location	14N		14E		15N		15E		16N		16E	
Elevation @ Sea Level	22.87		22.77		26.51		26.51		31.36		31.32	
	depth to water	elevation	depth to water	elevation	depth to water	elevation	depth to water	elevation	depth to water	elevation	depth to water	elevation
Elevation Average		10.09		10.06		9.85		9.93		na		na
DATE												
12/10/2001	12.5	10.37	12.42	10.35	16.31	10.20	16.33	10.18	dry	na	dry	na
1/3/2002	12.37	10.50	12.31	10.46	16.21	10.30	16.22	10.29	dry	na	dry	na
2/13/2002	12.70	10.17	12.63	10.14	16.57	9.94	16.62	9.89	dry	na	dry	na
3/27/2002	12.61	10.26	12.55	10.22	16.52	9.99	16.47	10.04	dry	na	dry	na
4/19/2002	12.75	10.12	12.68	10.09	16.64	9.87	16.61	9.90	dry	na	dry	na
5/3/2002	13.03	9.84	12.96	9.81	16.97	9.54	16.94	9.57	dry	na	dry	na
6/5/2002	13.04	9.83	12.97	9.80	16.63	9.88	16.95	9.56	dry	na	dry	na
7/8/2002	12.86	10.01	12.79	9.98	16.77	9.74	16.72	9.79	dry	na	dry	na
8/2/2002	12.86	10.01	12.79	9.98	16.8	9.71	15.73	10.78	dry	na	dry	na
9/5/2002	12.86	10.01	12.78	9.99	16.77	9.74	16.75	9.76	dry	na	dry	na
9/26/2002	12.94	9.93	12.85	9.92	16.85	9.66	16.83	9.68	dry	na	dry	na
11/6/2002	12.64	10.23	12.58	10.19	16.59	9.92	16.48	10.03	dry	na	dry	na
12/6/2002	13.02	9.85	12.94	9.83	16.97	9.54	16.95	9.56	dry	na	dry	na
1/2/2003	13.07	9.80	13.00	9.77	17.03	9.48	17.01	9.50	dry	na	dry	na
2/12/2003	13.20	9.67	13.12	9.65	17.19	9.32	17.16	9.35	dry	na	dry	na
3/4/2003	13.21	9.66	13.15	9.62	17.22	9.29	17.20	9.31	dry	na	dry	na
4/1/2003	12.90	9.97	12.83	9.94	16.82	9.69	16.79	9.72	dry	na	dry	na

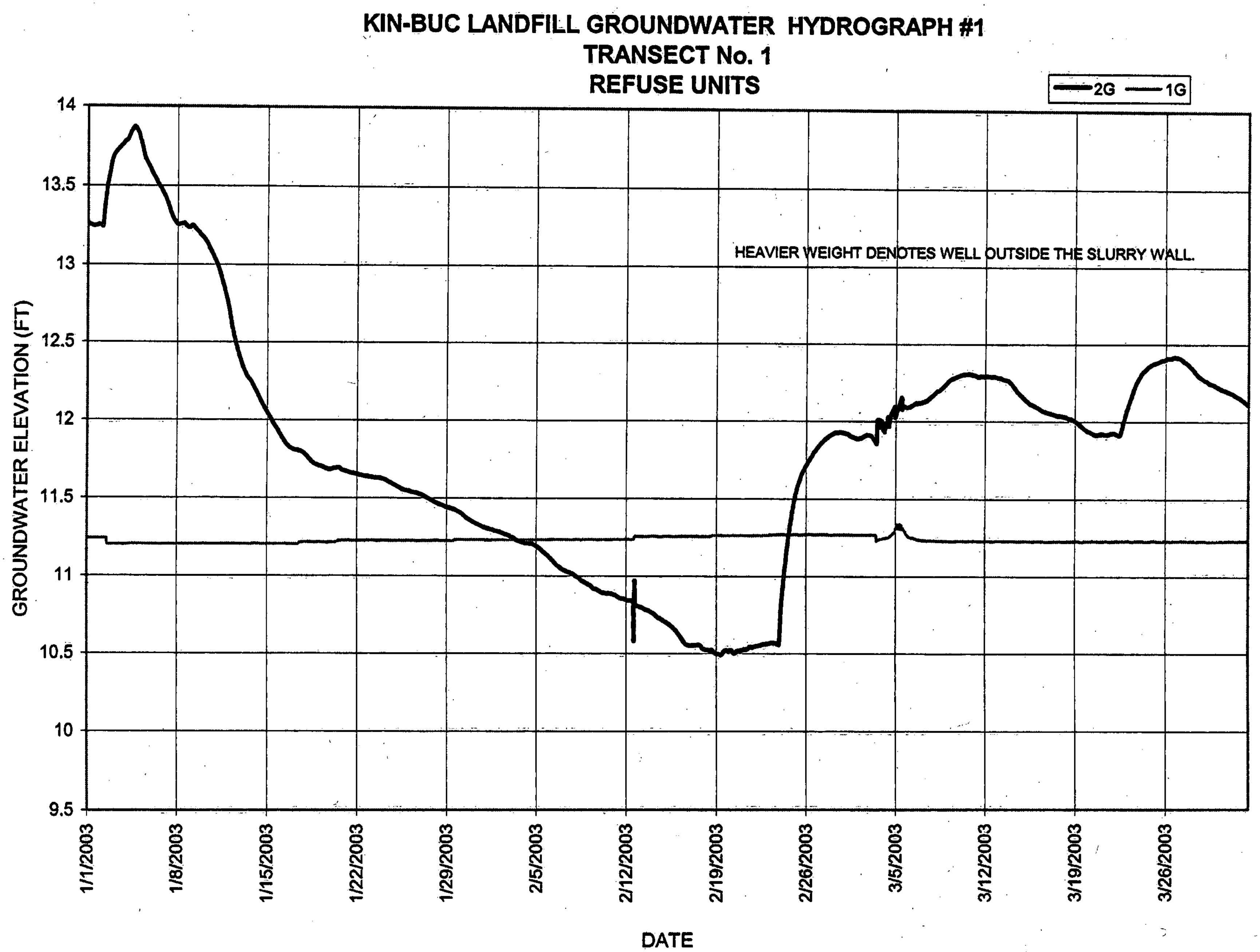
Table 5-1

Kin-Buc Landfill
Operable Unit 1
First Quarter 2003 Modified Program
Gas Monitoring Well Network/Results

Well (Network) Location	Monitoring Result	
	% LEL	% GAS
GMW-01	0	0
GMW-02	0	0
GMW-03	0	0
GMW-04	0	0
GMW-05	0	0
GMW-06	0	0
Operational Flare Inlet	NA	54

APPENDIX A

CONTINUOUS WATER LEVEL MONITORING RESULTS



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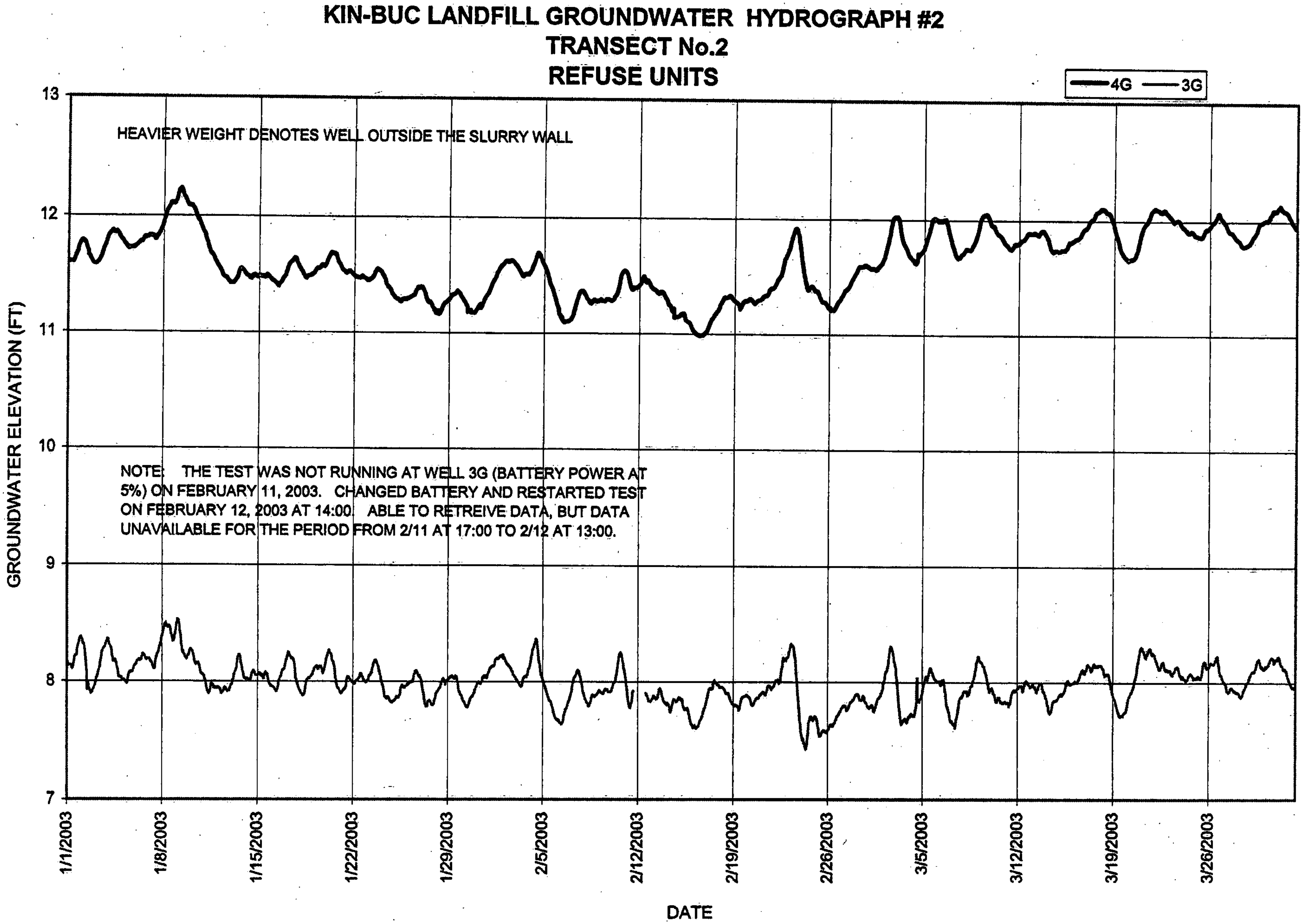

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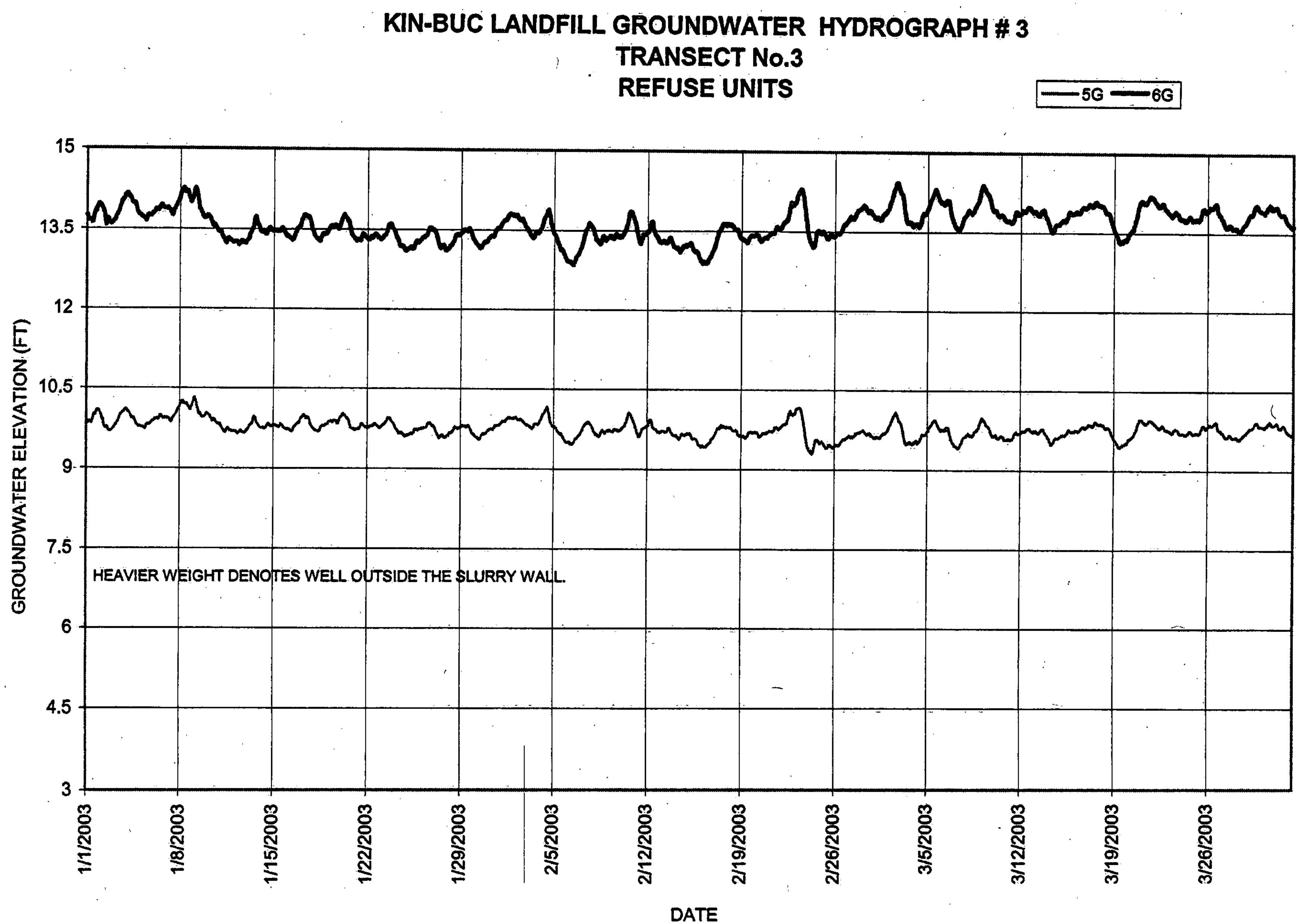

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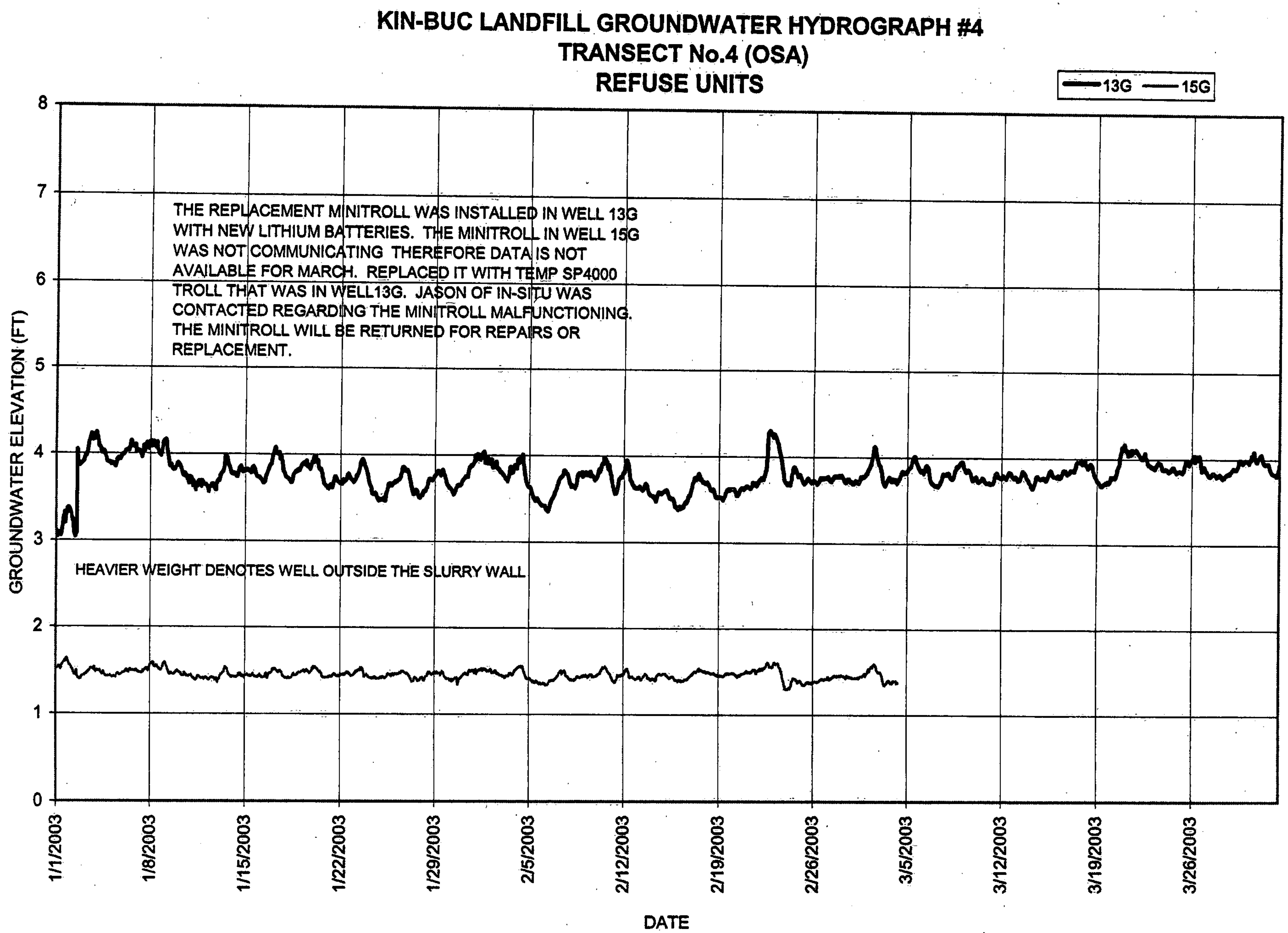

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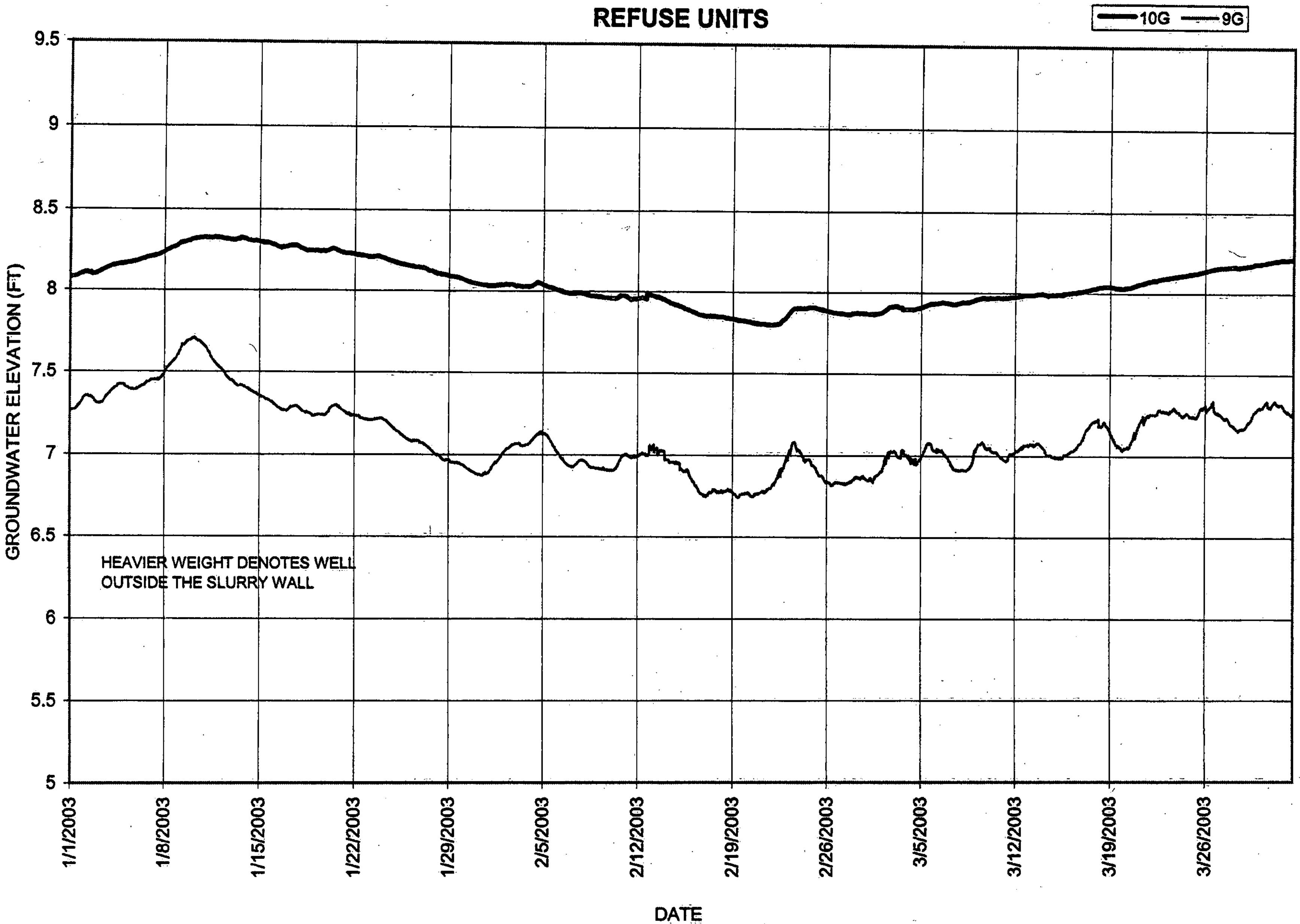
REFUSE UNITS



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KIN-BUC LANDFILL GROUNDWATER HYDROGRAPH #6
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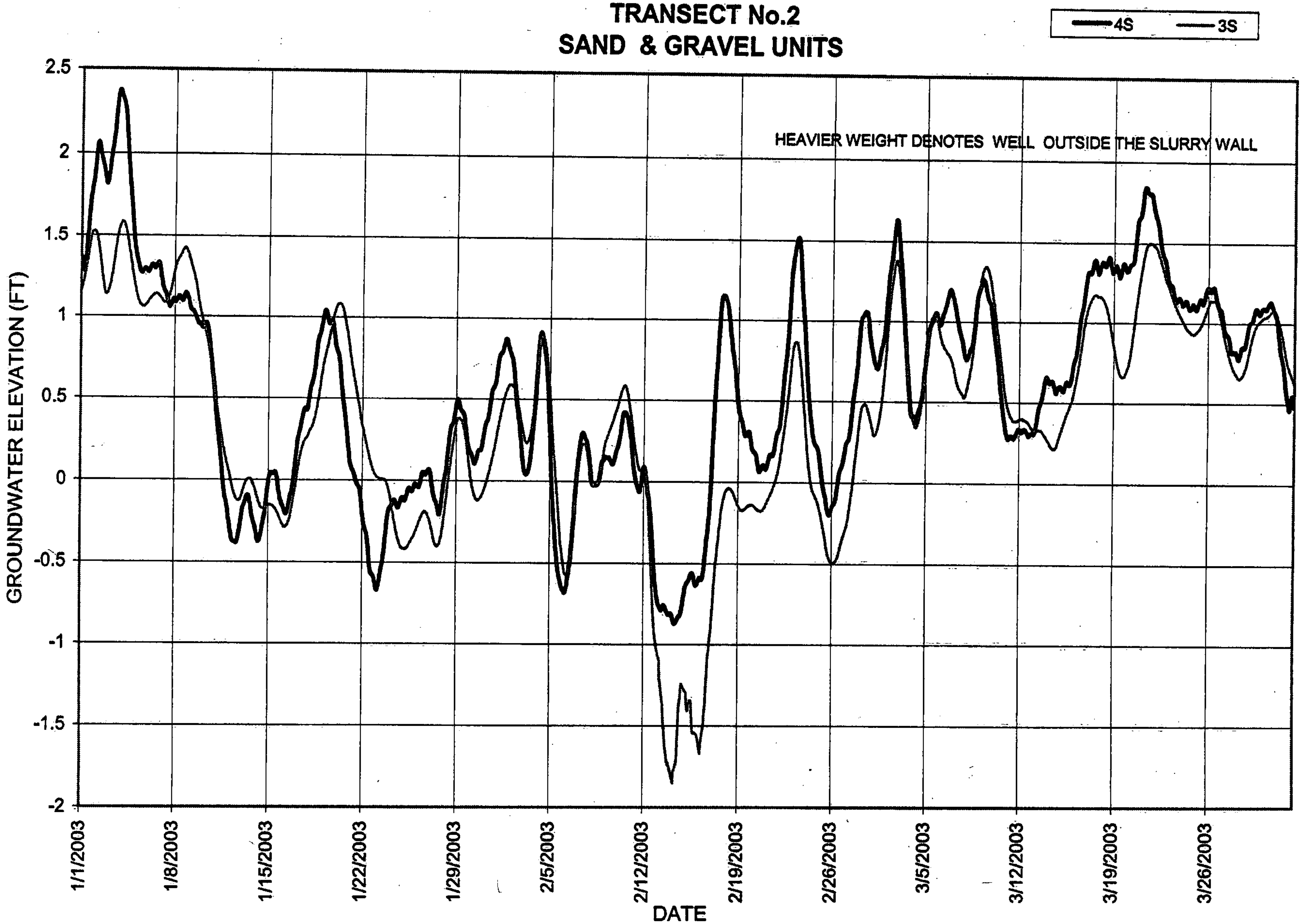
SAND & GRAVEL UNITS



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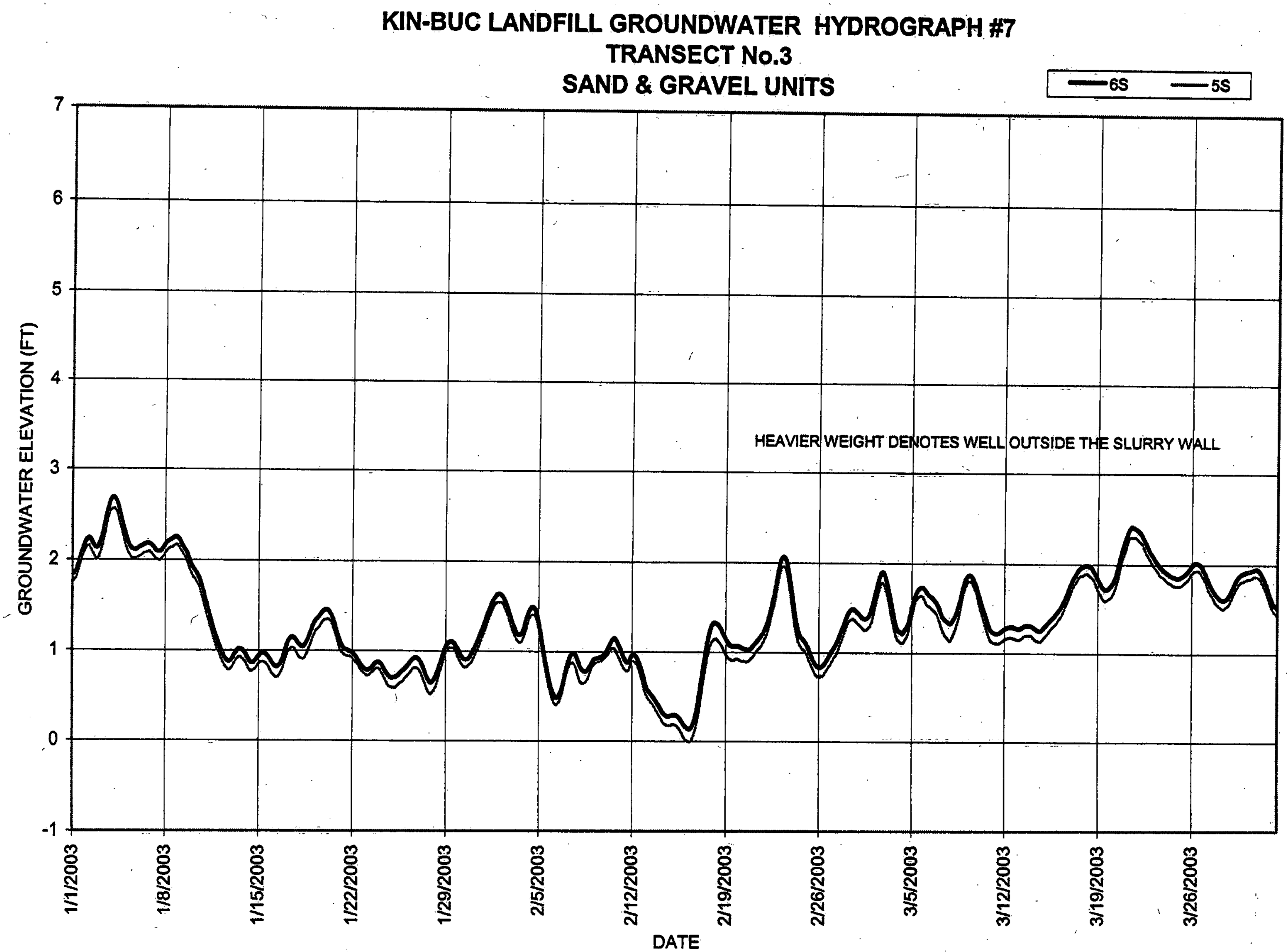

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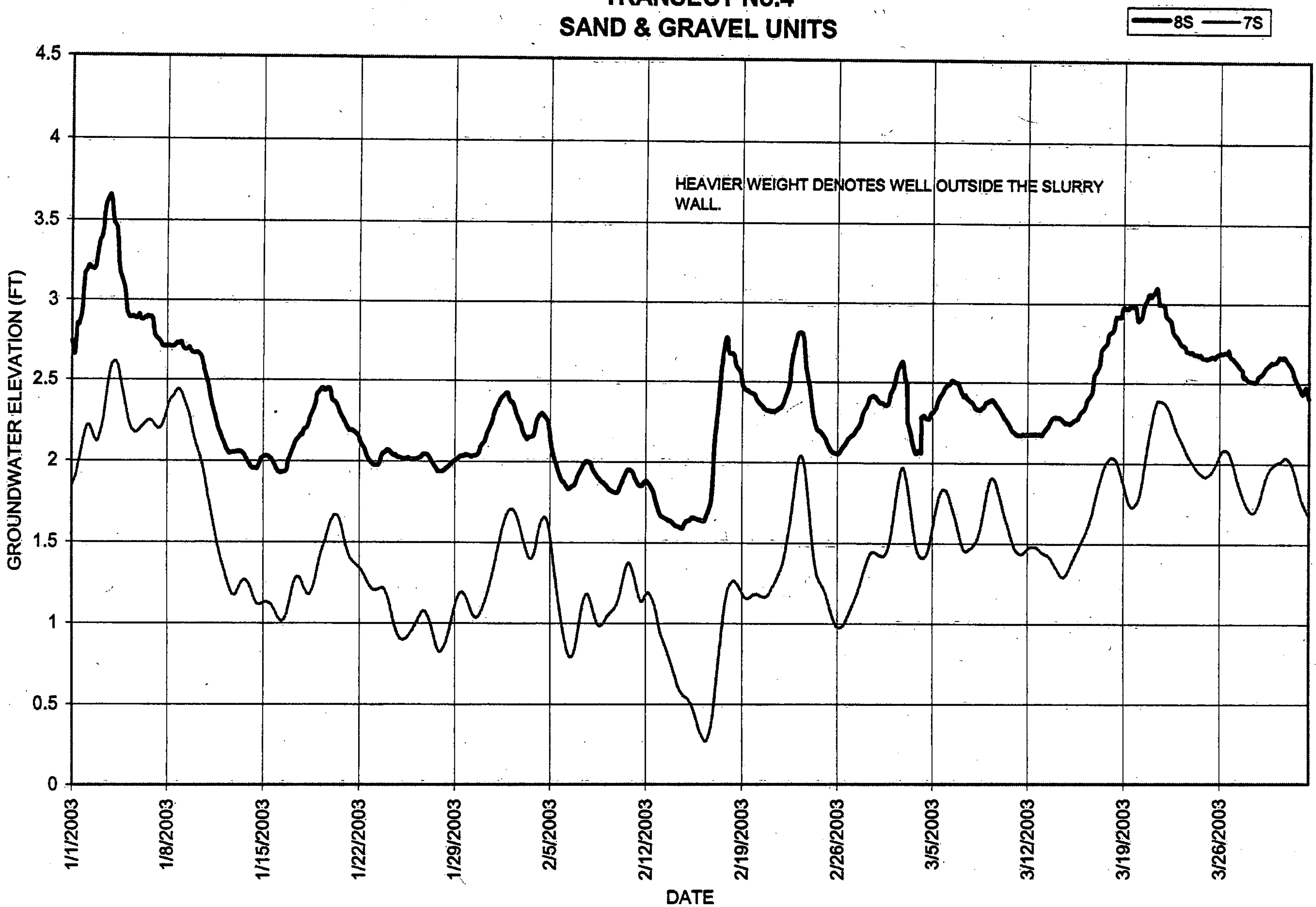
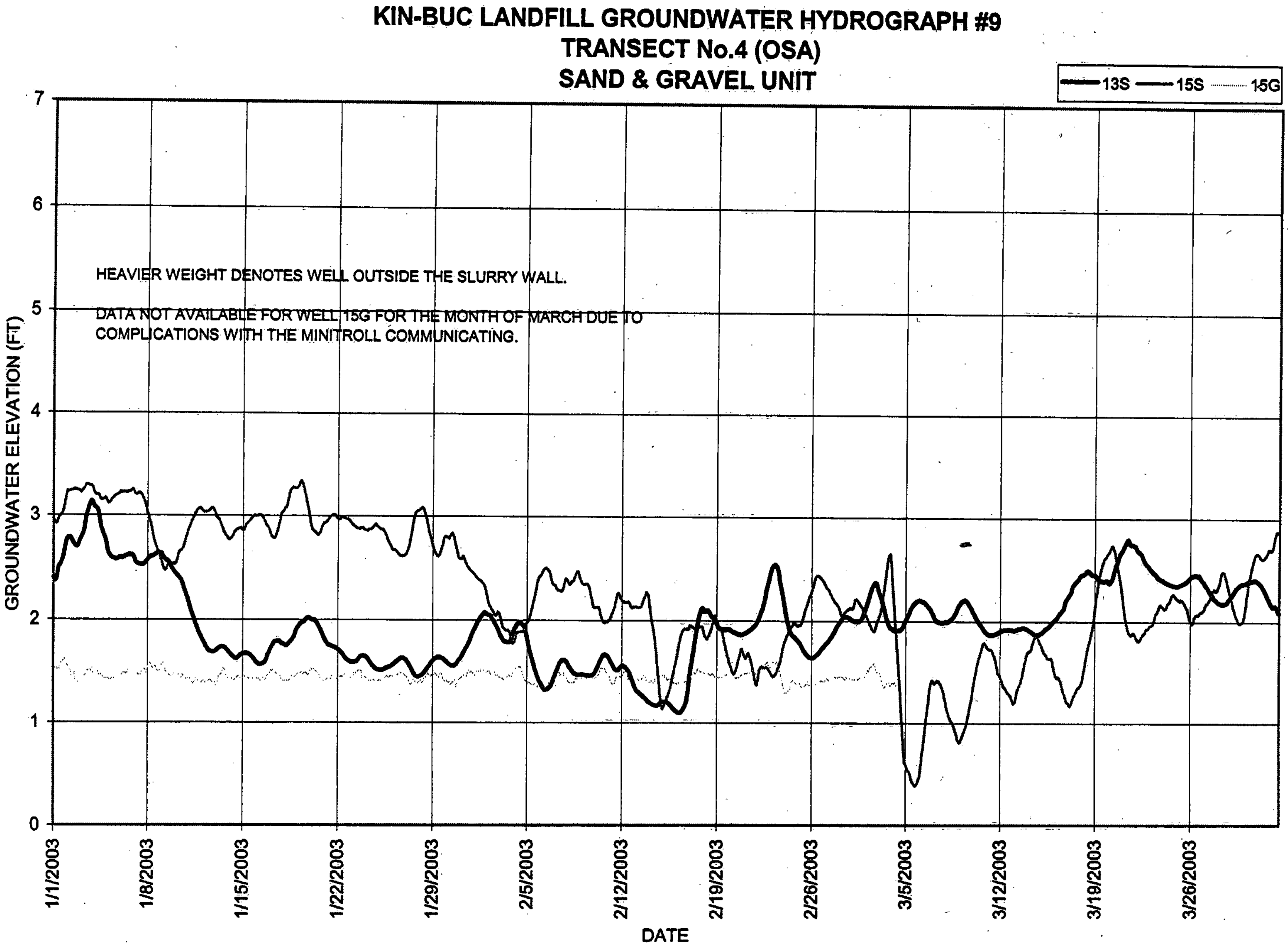
KIN-BUC LANDFILL GROUNDWATER HYDROGRAPH #8
TRANSECT No.4
SAND & GRAVEL UNITS





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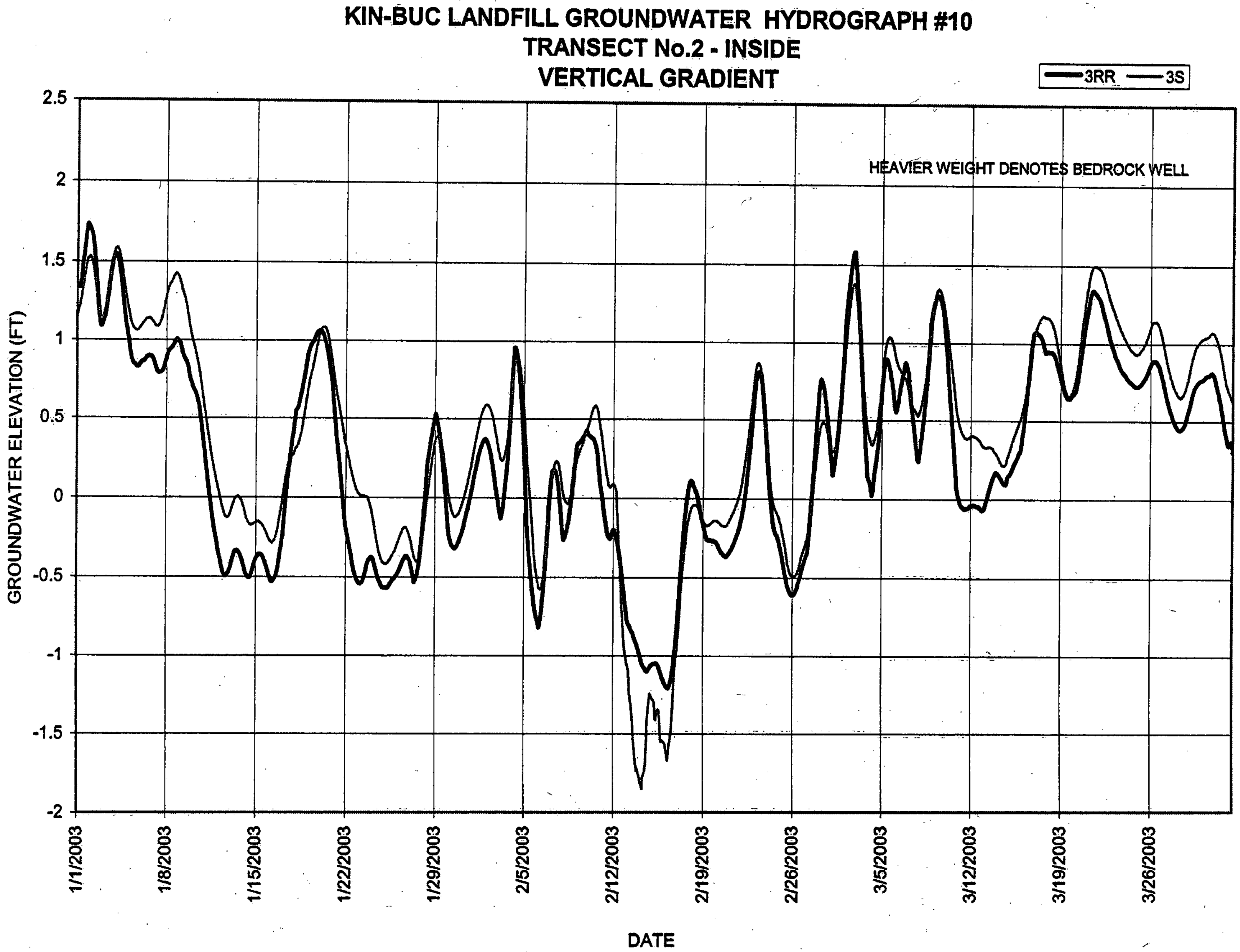

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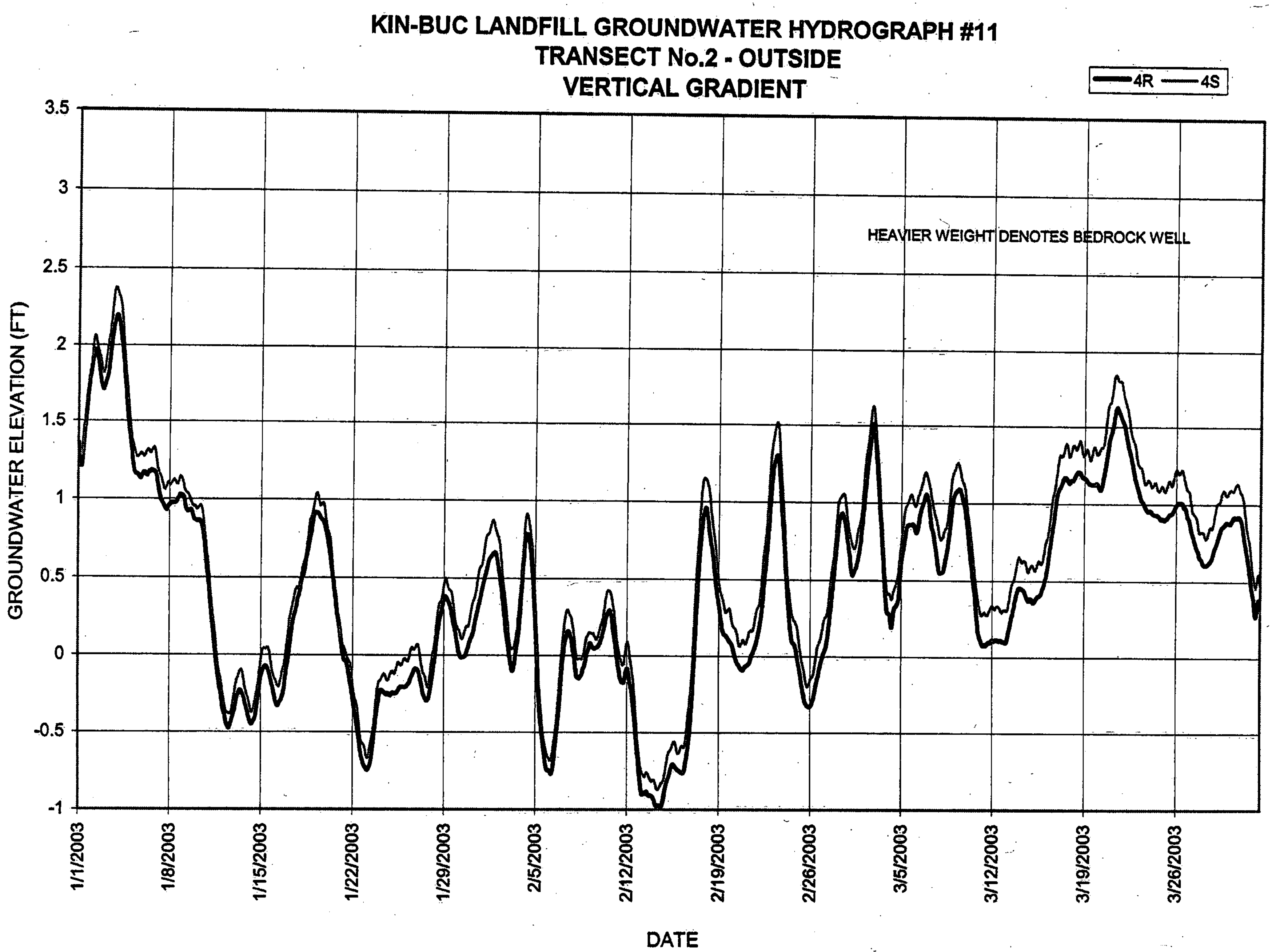

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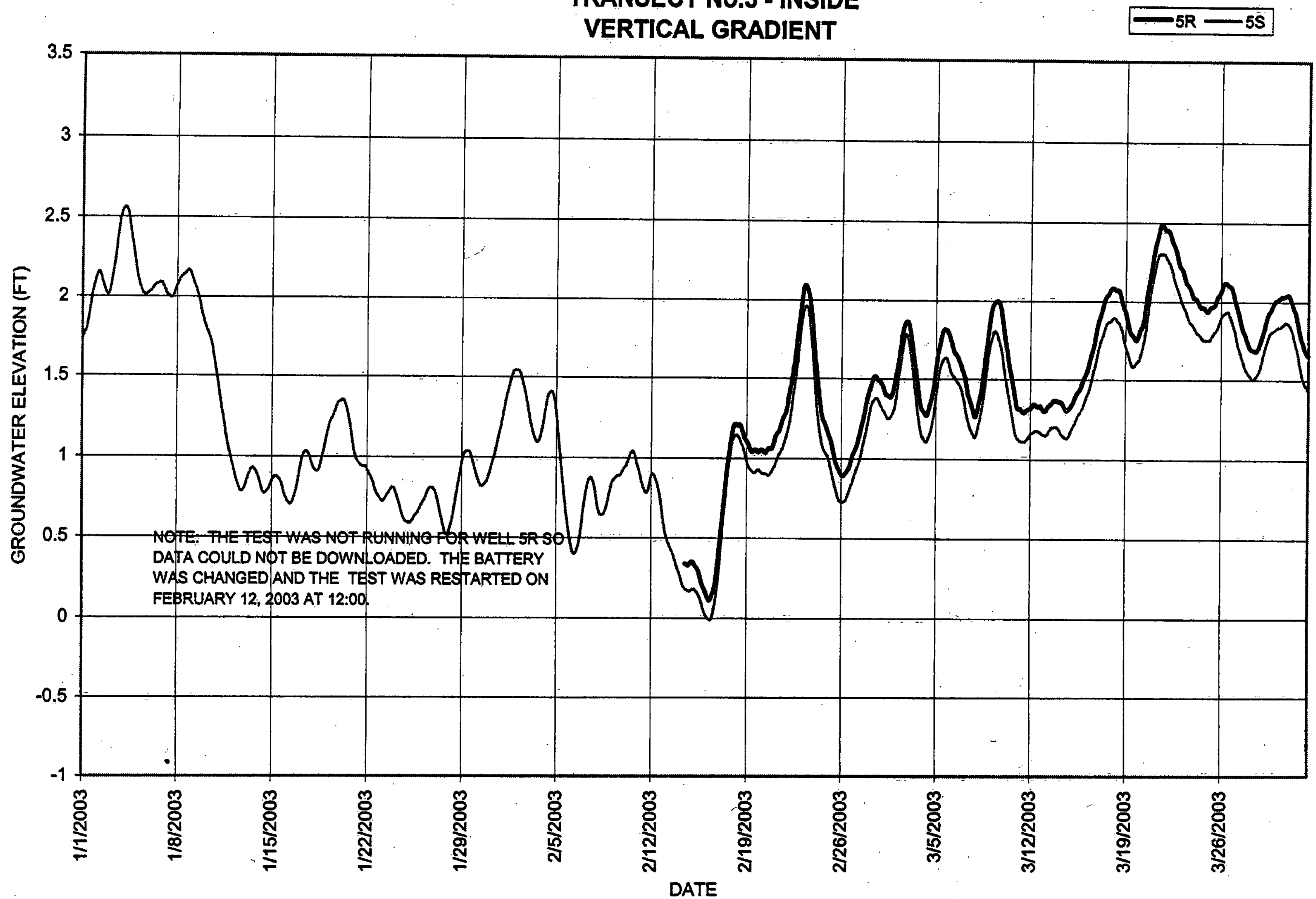
KIN-BUC LANDFILL GROUNDWATER HYDROGRAPH #12
TRANSECT No.3 - INSIDE
VERTICAL GRADIENT



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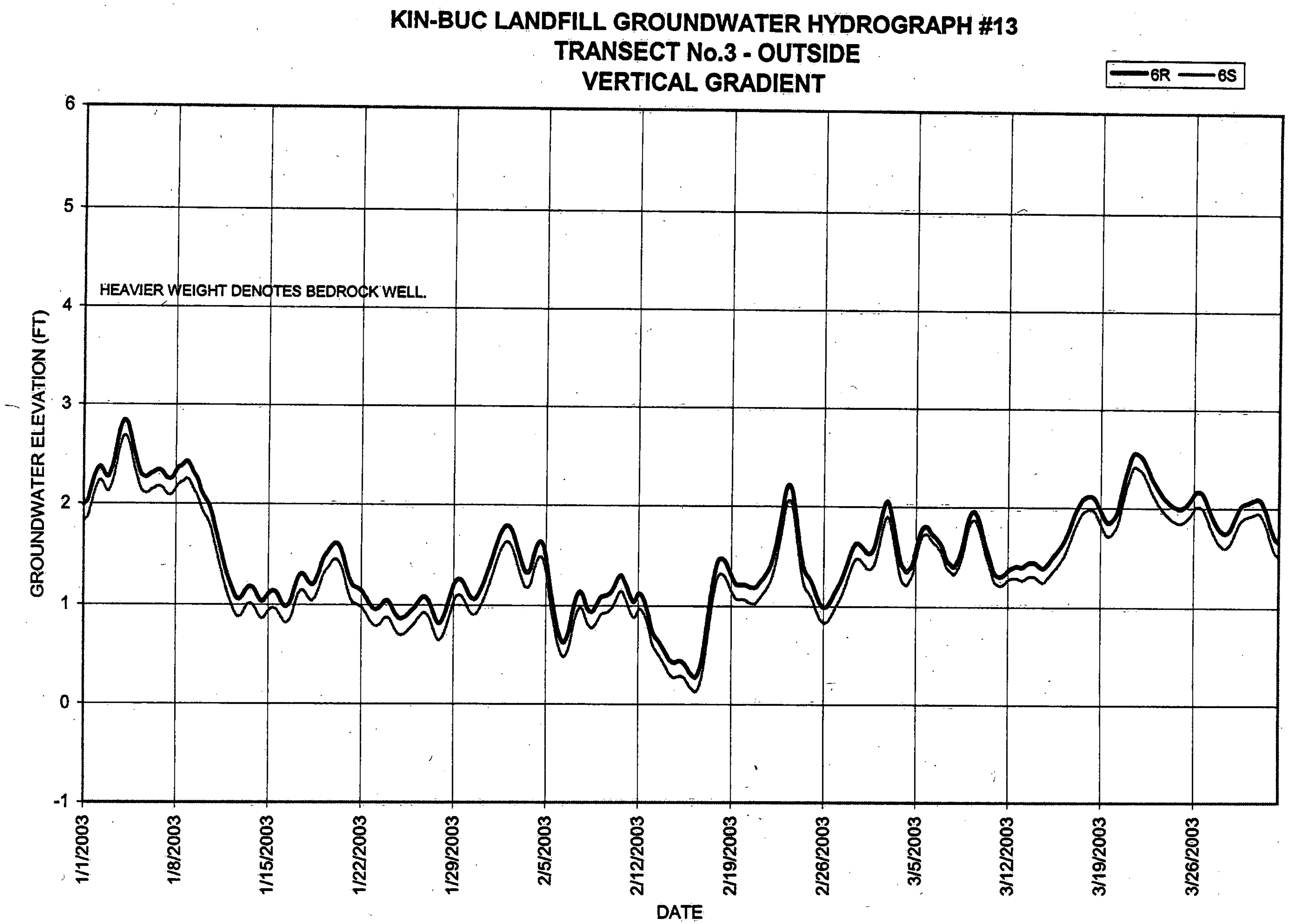

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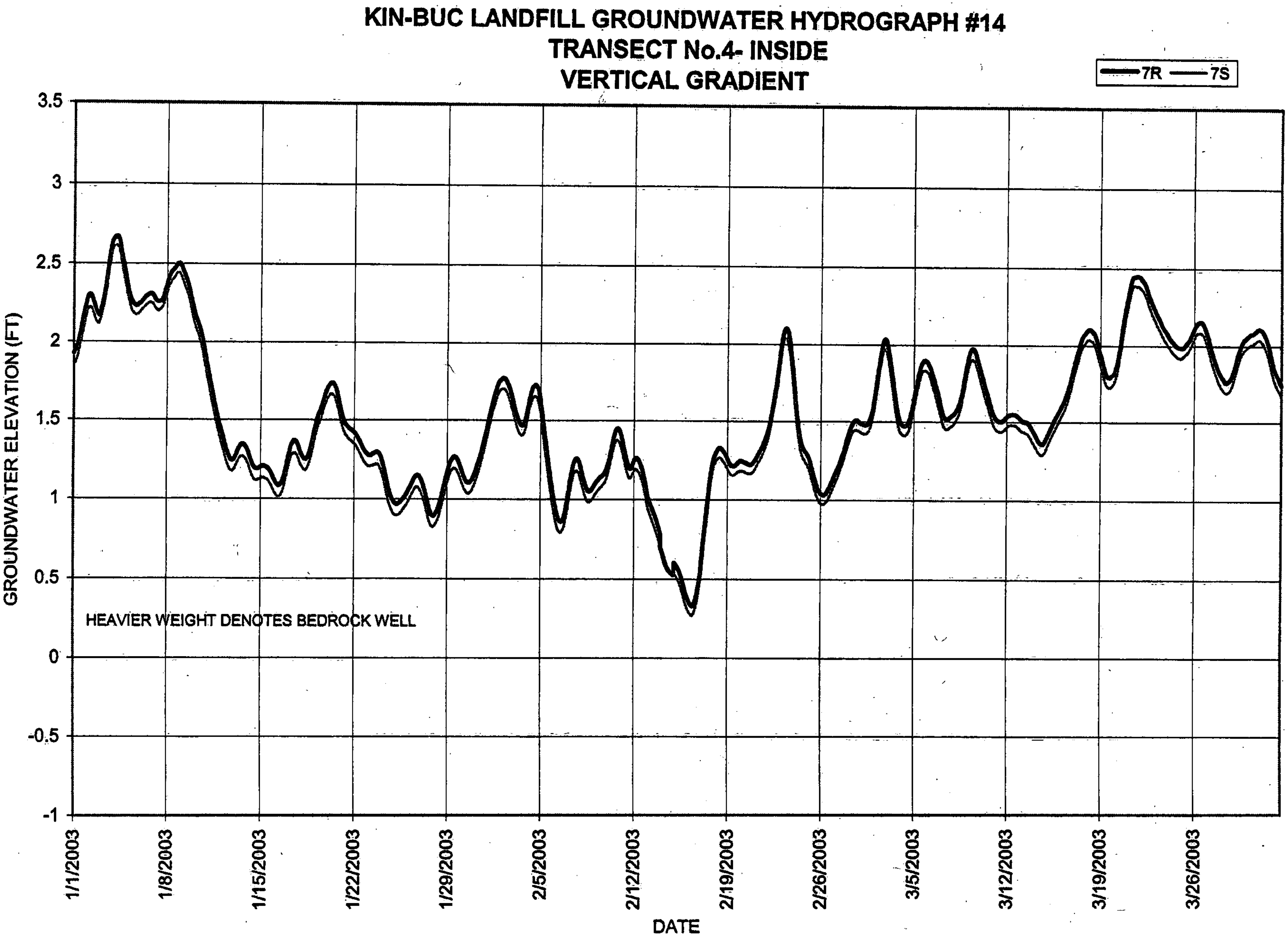

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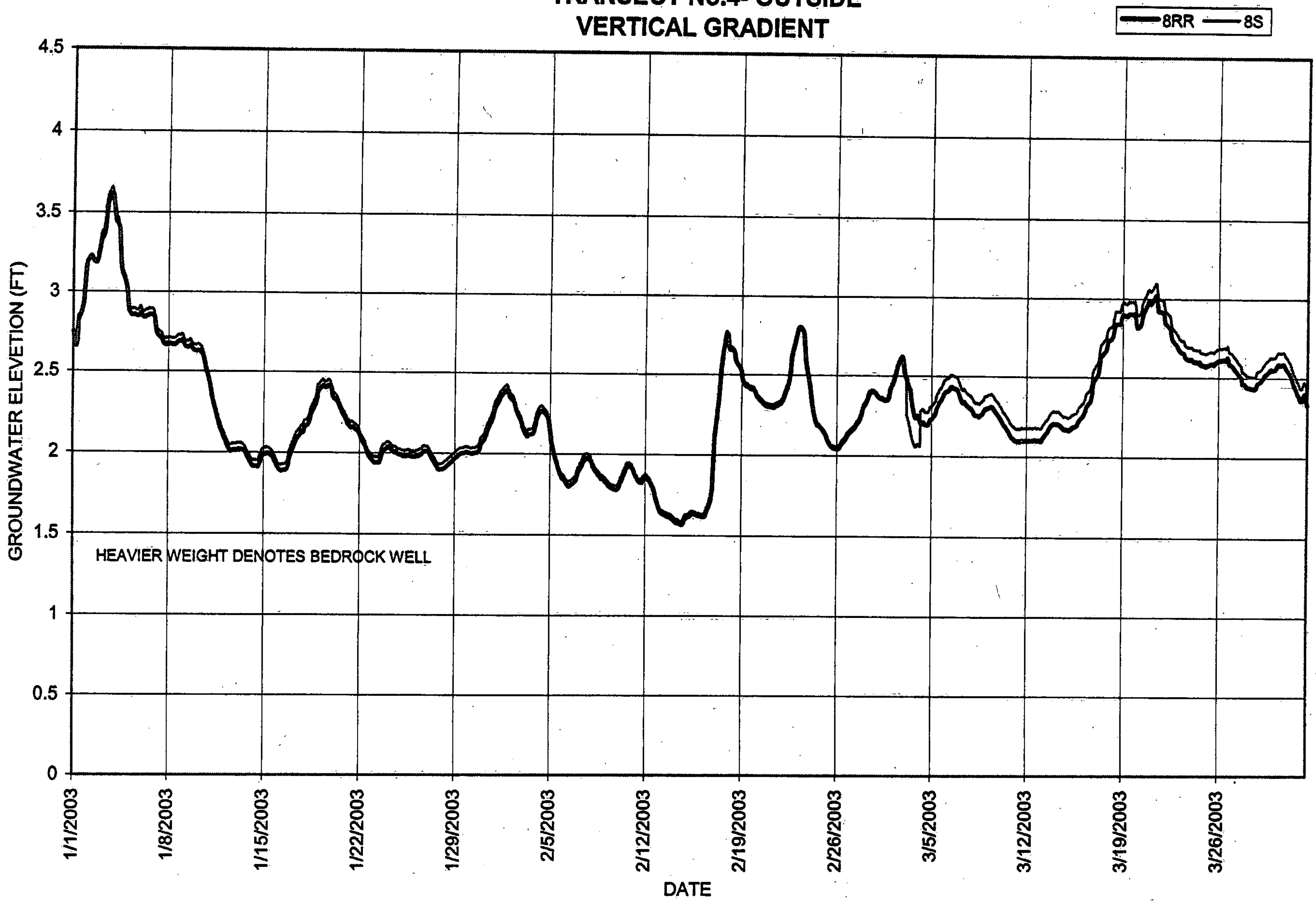
KIN-BUC LANDFILL GROUNDWATER HYDROGRAPH #15
TRANSECT No.4- OUTSIDE
VERTICAL GRADIENT



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APPENDIX B

MONTHLY HYDRAULIC EVALUATIONS

EMCON/OWT, Inc.
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201.512.5700
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Shaw™ EMCON/OWT, Inc.

March 12, 2003
Project 791186

Mr. Carl Januszkiewicz
Waste Management, Inc.
Kin-Buc Landfill Treatment Plant
383 Meadow Road
Edison, NJ 08817

Re: Hydraulic Monitoring for January 2003

Dear Mr. Januszkiewicz:

Site visits were completed on February 12, 2003 and February 14, 2003 to download the January water level recorder data and obtain manual water level measurements. The following is an update of the hydraulic monitoring for the month of January 2003 at the Kin-Buc Landfill. This information is to be included in the quarterly report, which is to be submitted to the EPA by mid-May 2003.

The minimum, maximum, and average water elevations recorded at each well are included in Table 1. Table 2 shows the troll water elevations versus the manual water elevations. The continuous water level elevation data when compared with manual readings indicated that the miniTrolls are functioning properly and are recording accurate data with the exception of Well 5R. The test was not running at the time of the download and the data could not be retrieved.

Several of the miniTrolls had little to no battery power at the time of the monthly data downloads. The original alkaline batteries in these miniTrolls were replaced with new alkaline batteries during the site visit on February 12, 2003. This included the miniTrolls in Wells 2G, 3G, 5R, 8S, 9G, 10G, 13S, and 15G. The remaining miniTroll batteries will be changed during the next site visit in March. The miniTroll battery in Well 3G failed on Februay 11, 2003 and was replaced on February 12, 2003. The EMCON/OWT, Inc. Field Technician was able to retrieve the past data and the test was restarted. There is no data for the time between February 11th and February 12th while the miniTroll was not running.

During this site visit, discoloration was observed on some of the miniTrolls including the miniTrolls in Wells 8S and 10G. There were problems running the tests and downloading data. In some cases, several attempts were made before data was retrieved. These problems are most likely due to the lack of battery power and/or the discoloration on the miniTrolls or cable. In-Situ has been contacted and the mechanical problems with the miniTrolls are being assessed. The cable hook on the miniTroll in Well 13G was not attached correctly. Therefore, the miniTroll was removed and the SP4000 Troll was placed in Well 13G.

Hydrographs have been prepared for each of the transect locations and are enclosed for your reference as Attachment No. 1. The water levels in wells on the outside of the slurry wall vary over the course of the day due to the tidal influence at the site. For clarity, Hydrograph Nos. 6 through 15 show the average water level in the well over a 24-hour period (12 hours before, and 12 hours after).

Refuse

As defined in the Record of Decision (ROD) for OU-1, the performance objective for the refuse unit calls for the pumping of leachate to establish inward gradients across the slurry wall with the additional benefit of reducing downward flow into the underlying sand and gravel unit. Based on the hydrographs the following is presented.

Transect 1-Refuse (1G/2G)/Hydrograph No. 1 - Intragradient conditions were observed during the month of January, but were not maintained into the month of February. The average monthly water elevation for January at Well 1G (inside) and Well 2G (outside) was 11.22 and 12.31 feet msl, respectively. Water level elevation measurements taken from Leachate Collection Cleanouts Nos. 14 through 16 are included in Table 3, and indicate that the leachate collection system is functioning properly. The fact that the leachate collection system is functioning properly suggests significant capture of leachate. The evaluation of the hydraulic conditions in the refuse at Transect 1 is provided in Attachment No.2.

Transect 2-Refuse (3G/4G)/Hydrograph No. 2 – Intragradient conditions were maintained throughout the month of January. The average monthly water elevation for the month at Well 3G (inside) and Well 4G (outside) was 8.06 and 11.57 feet msl, respectively

Transect 3-Refuse (5G/6G)/Hydrograph No. 3 – Intragradient conditions were maintained throughout the month of January. The average monthly water elevation for the month of January at Well 5G (inside) and Well 6G (outside) was 9.83 and 13.54 feet msl, respectively.

Transect 4-Refuse Oil Seeps Area (13G/15G)/Hydrograph No. 4 – Intragradient conditions were maintained throughout the month of January. The average monthly water elevation for the month of January at Well 15G (inside) and Well 13G (outside) was 1.46 and 3.77 feet msl, respectively. The minTroll in Well 13G was removed and replaced with the SP4000 Troll on February 14, 2003 due to a problem with the cable. The cable was sent into In-Situ for repairs.

Transect 5-Refuse (9G/10G)/Hydrograph No. 5 – Intragradient conditions were maintained throughout the month of January. The average monthly water elevation for the month of January at Well 9G (inside) and Well 10G (outside) was 7.29 and 8.20 feet msl, respectively.

Sand and Gravel/Bedrock

For the sand and gravel unit, the performance objectives call for pumping of sand and gravel groundwater to prevent flow toward the slurry wall and to impose upward hydraulic gradients from the bedrock to the sand and gravel. An additional benefit would be the establishment of inward gradients across the slurry wall within the sand and gravel unit. The following is a description of the flow characteristics based on visual observation of the hydrographs.

<u>Horizontal Flow</u>

Transect 2-Sand and Gravel (3S/4S)/Hydrograph No. 6 – Intragradient conditions were not consistently maintained throughout the month of January. The average monthly water elevations for the month of January at Well 3S (inside) and Well 4S (outside) was 0.46 and 0.52 feet msl, respectively.

Transect 3-Sand and Gravel (5S/6S)/Hydrograph No. 7 – Intragradient conditions were maintained throughout the month of January. The average monthly water elevation for Well 5S (inside) and Well 6S (outside) was 1.27 and 1.37 feet msl, respectively.

Transect 4-Sand and Gravel (7S/8S)/Hydrograph No. 8- Intragradient conditions were maintained throughout the month of January. The average monthly water elevation for the month of January at Well 7S (inside) and Well 8S (outside) was 1.53 and 2.37 feet msl, respectively.

Transect 4 Sand and Gravel Oil Seeps Area (13S/15S)/Hydrograph No. 9 – Intragradient conditions were not evident during the month of January. The average monthly water elevation for the month of January at Well 15S (inside) and Well 13S (outside) was 2.94 and 2.00 feet msl, respectively. Water levels from Well 15G in the refuse unit are included on the hydrograph for comparison.

<u>Vertical Flow-Inside Slurry Wall</u>

Transect 2-Vertical Gradient (3S/3RR)-Inside/Hydrograph No.10 – Upward gradient conditions were not observed between the bedrock and overlying sand & gravel units inside the slurry wall for the month of January. The average monthly water elevation for the month of January at Well 3S (sand & gravel) and Well 3RR (bedrock) was 0.46 and 0.28 feet msl, respectively.

Transect 3-Vertical Gradient (5R/5S)-Inside/Hydrograph No. 12 – Continuous water level recorder data is not available for Well 5R for the month of January due to mechanical problems with the miniTroll. The test was not running at the time of the site visit therefore data could not be downloaded. The test was restarted on February 12, 2003 at 12:00pm. The average monthly water elevation for the month of January at Well 5S (sand & gravel) and Well 5R (bedrock) was 1.27 and 0.74 (taken from manual water level data) feet msl, respectively.

Transect 4-Vertical Gradient (7R/7S)-Inside/Hydrograph No. 14 – Slight upward gradient conditions were observed between the bedrock and overlying sand & gravel units inside the slurry wall throughout the month of January. The average monthly water elevation for the month of January at Well 7S (sand & gravel) and Well 7R (bedrock) was 1.53 and 1.60 feet msl, respectively. The difference in average monthly water elevations was less than 0.1 feet.

Vertical Flow-Outside Slurry Wall

Transect 2-Vertical Gradient (4S/4R)-Outside/Hydrograph No. 11 – Upward gradient conditions were not observed between the bedrock and overlying sand & gravel units outside the slurry wall for the month January. The average monthly water elevation for the month of January at Well 4S (sand & gravel) and Well 4R (bedrock) was 0.52 and 0.41 feet msl, respectively.

Transect 3-Vertical Gradient (6R/6S)-Outside/Hydrograph No. 13 – Upward gradient conditions were observed between the bedrock and overlying sand & gravel units outside the slurry wall for the month of January. The average monthly water elevation for the month of January at Well 6S (sand & gravel) and Well 6R (bedrock) was 1.37 and 1.53 feet msl, respectively.

Transect 4-Vertical Gradient (8RR/8S)-Outside/Hydrograph No. 15 – Upward gradient conditions were not observed between the bedrock and overlying sand & gravel units outside the slurry wall throughout the month of January. The average monthly water elevation for the month of January at both Well 8S (sand & gravel) and Well 8RR (bedrock) was 2.37 and 2.34 feet msl, respectively. The difference in average monthly water elevations for January was 0.03 feet, respectively.

An initial review of the hydrographs indicates that certain performance objectives associated with the sand and gravel and bedrock units may not be met, specifically associated with the uniform achievement of upward gradients from the bedrock to the overlying sand and gravel (e.g. Hydrograph 10), and inward gradients across the slurry wall within the sand and gravel (Hydrographs 6 and 9). However previous investigations performed at the site would indicate that complete control of OU-1 groundwater can be achieved notwithstanding indications of downward flow from the sand and gravel to the bedrock, or outward flow across the slurry wall within the sand and gravel unit. This is based on the findings of the considerable pumping influence of the sand and gravel pumping wells, in particular S&G#2, in achieving hydraulic control at the site (see Groundwater Pumping Well Performance Evaluation Report, July 2000).

The influence of the pumping well can be demonstrated by review of a plan view groundwater contour map of the sand and gravel (Figure 1) and equipotential profiles and vector diagrams (Figures 1, 2, 3, and 4) that have been prepared for a period of time when the vertical gradient between the sand and gravel and the bedrock was downward at Transect 2, and heads across the slurry wall within the sand and gravel unit were higher within the slurry wall versus outside the slurry wall. For this evaluation, a snapshot of groundwater elevations from the monitoring wells and pumping wells was obtained for January 11, 2003. At this time, S&G#2 was pumping at a rate of about 16 gallons per minute (gpm), while S&G#3 was pumping at a rate of 3 gpm. This resulted in a total of approximately 19 gpm or about 27,340 gallons per day. There was a downward vertical gradient observed the majority of the time between the sand and gravel and the bedrock inside the slurry wall at Transect No.2 in January and outside the slurry wall at Transect 3 as evidenced by higher heads in the sand and gravel wells relative to bedrock wells. Periodically, there was also a higher head within the sand and gravel inside the slurry wall relative to the sand and gravel outside the slurry wall at Transect No. 2 in January.

Figures 1-4 incorporate the heads induced by pumping and show the considerable pumping influence of S&G#2. Specifically, groundwater flowing downward from the sand and gravel into the bedrock subsequently flows toward the pumping well. This occurs both inside and outside of the slurry wall. Also, groundwater within the sand and gravel unit flows toward the pumping well. The considerable pumping influence demonstrated at S&G#2, in conjunction with the fact that natural groundwater gradients in both the sand & gravel and bedrock flow predominantly towards the area of S&G#2, result in the complete capture of OU-1 groundwater at these pumping rates.

Groundwater and Leachate Collection

Based on data provided by U.S. Filter, the following volumes of groundwater and leachate were extracted from the sand & gravel wells and leachate collection system for the period from January 1 to January 31, 2003:

S&G No. 1 Groundwater	S&G No. 2 Groundwater	S&G No. 3 Groundwater	S&G No. 4 Groundwater	Leachate
0 gal.	568,574 gal.	105,964 gal.	0 gal.	60,927 gal.
0 gpd	18,341 gpd	3,418 gpd	0 gpd	1,965 gpd

For the month of January, a total of 674,538 gallons of groundwater was collected. The average daily groundwater extraction rate for all of the wells was 21,759 gpd. The extraction rate from S&G No. 2 was 18,341 gpd and the extraction rate from S&G No. 3 was 3,418 gpd. The leachate extraction rate of 1,965 gpd exceeded the recommended rate of 1,500 gpd.

CONCLUSIONS

- Intragradient conditions were maintained in the refuse unit at Transects 2, 3, 4, and 5.
- Intragradient conditions were maintained throughout the month of January, but not consistently indicated into February by the monitoring wells at Transect 1, although levels in the leachate collection system indicate intragradient conditions are present at this location.
- Hydraulic control was maintained within OU-1 based on the analysis of the significant influence of S&G#2 in acting as a hydraulic sink for sand and gravel and bedrock groundwater. Groundwater flow in the sand and gravel and bedrock is ultimately captured by the pumping wells (S&G#2 and S&G#3) resulting in overall containment of groundwater in OU-1.
- In view of the analysis presented herein, it is recommended that the combined groundwater pumping rates in the sand and gravel be maintained at 15,000 gpd with S&G#2 and S&G#3 pumping at 10,000 gpd and 5,000 gpd, respectively. These lower pumping rates will be evaluated to confirm continued hydraulic control of OU-1 groundwater.

We trust you find this information useful. If you have any questions, please do not hesitate to contact us.

EMCON/OWT, INC.

Steven Goldberg
Steven Goldberg, Ph.D, CPG
Senior Hydrogeologist

Laura Kisala
Laura Kisala
Environmental Scientist

Attachments

cc: Glenn Grieb, US Filter
Tim Pagano, EMCON/OWT, Inc.

1" 1/2"

IMAGE Files: <No Images>
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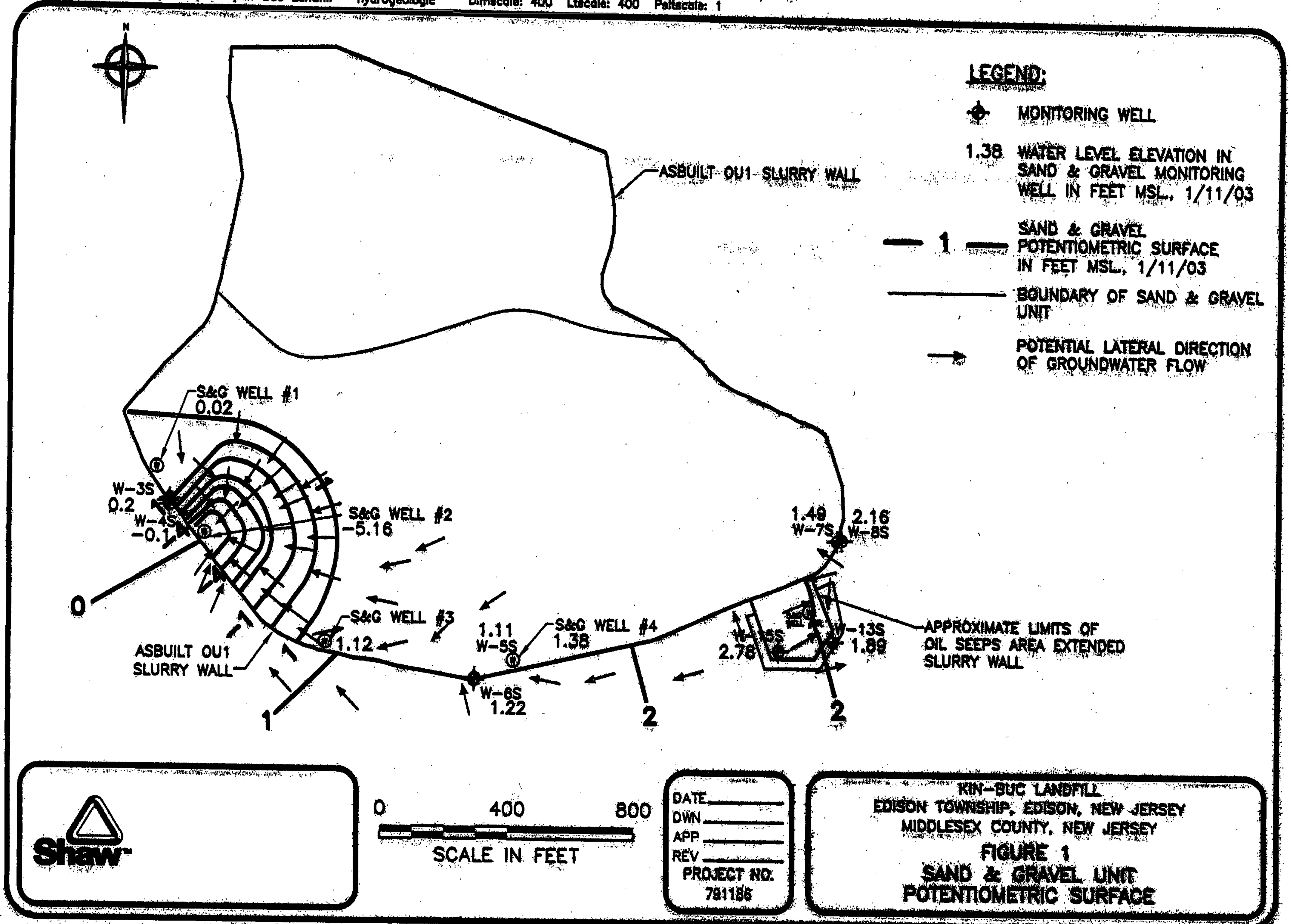

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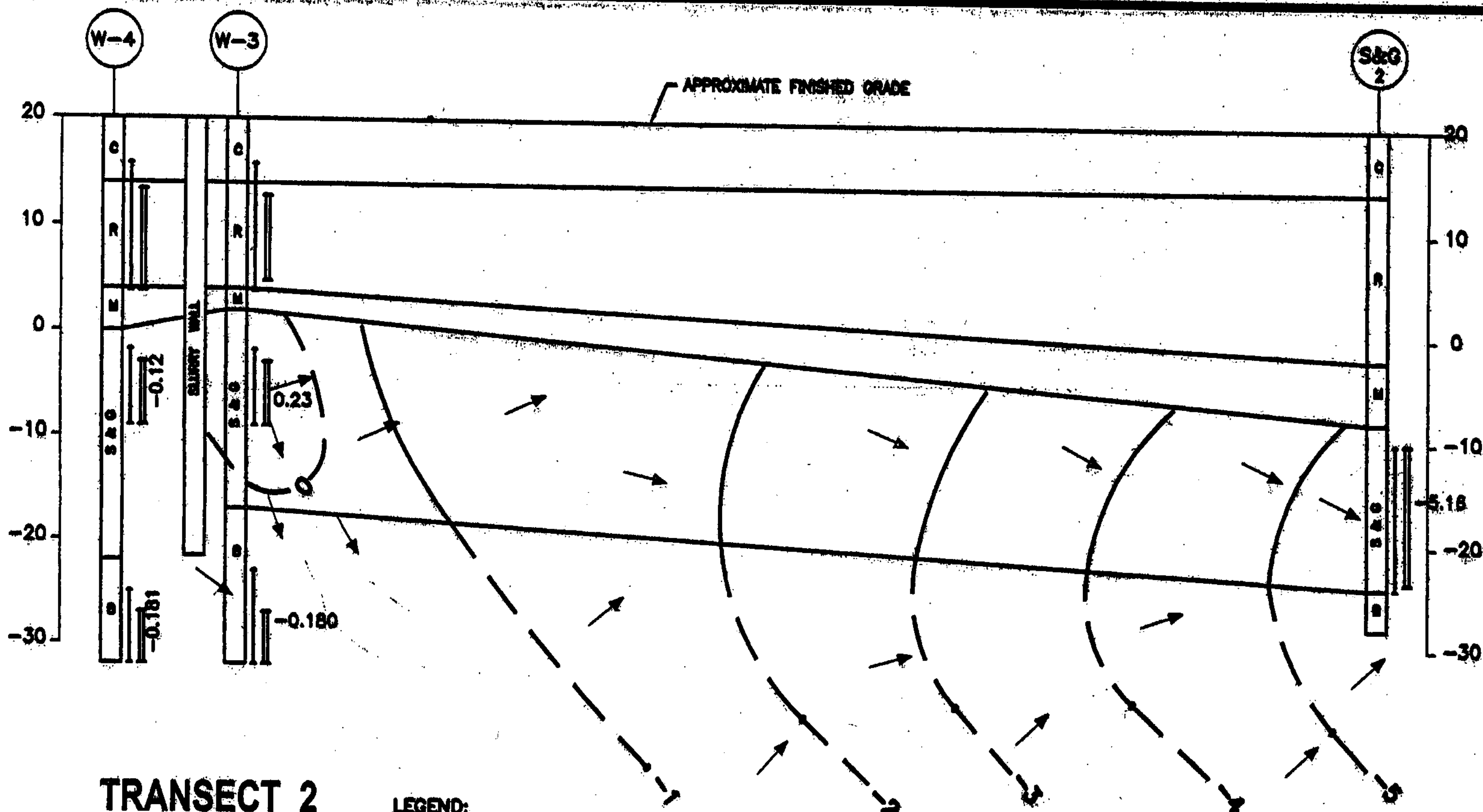

TRANSECT 2

SCALE: N.T.S.

LEGEND:

B - BEDROCK
C - CAP
R - REFUSE
M - MEADOW MAT
S & G - SAND & GRAVEL

0.23 ELEVATION OF WATER LEVEL IN MONITORING WELL, IN FEET MSL, 1/11/03

— 1 — GROUNDWATER EQUIPOTENTIAL IN BEDROCK AND SAND & GRAVEL, IN FEET MSL, 1/11/03

→ POTENTIAL VERTICAL DIRECTION OF GROUNDWATER FLOW.

SAND PACK INTERVAL

SCREENED INTERVAL

Shaw

DATE
DWN
APP
REV
PROJECT NO.
791186

KIN-BUC LANDFILL
EDISON TOWNSHIP, EDISON, NEW JERSEY
MIDDLESEX COUNTY, NEW JERSEY

FIGURE 2
TRANSECT 2
HYDROGEOLOGIC CROSS SECTION ANALYSIS

IMAGE Files: <No Images>
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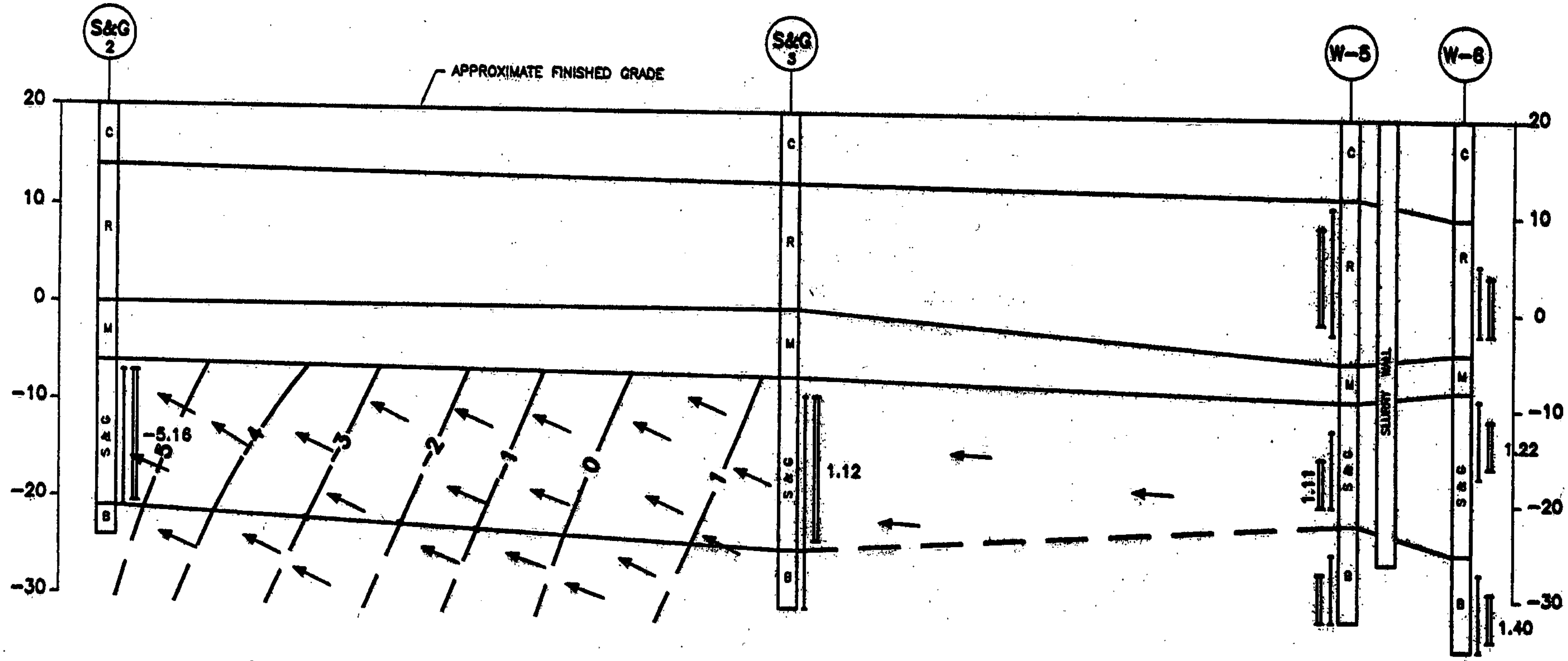

TRANSECT 3

SCALE: N.T.S.

LEGEND:

B	- BEDROCK	1.12	ELEVATION OF WATER LEVEL IN MONITORING WELL, IN FEET MSL., 1/11/03
C	- CAP		
R	- REFUSE	— —2— —	GROUNDWATER EQUIPOTENTIAL IN BEDROCK AND SAND & GRAVEL, IN FEET MSL., 1/11/03
M	- MEADOW MAT		
S & G	- SAND & GRAVEL	——>	POTENTIAL VERTICAL DIRECTION OF GROUNDWATER FLOW.

SAND PACK INTERVAL

SCREENED INTERVAL

Shaw

DATE
DWN
APP
REV
PROJECT NO.
791186

KIN-BUC LANDFILL
EDISON TOWNSHIP, EDISON, NEW JERSEY
MIDDLESEX COUNTY, NEW JERSEY

FIGURE 3
TRANSECT 3
HYDROGEOLOGIC CROSS SECTION ANALYSIS

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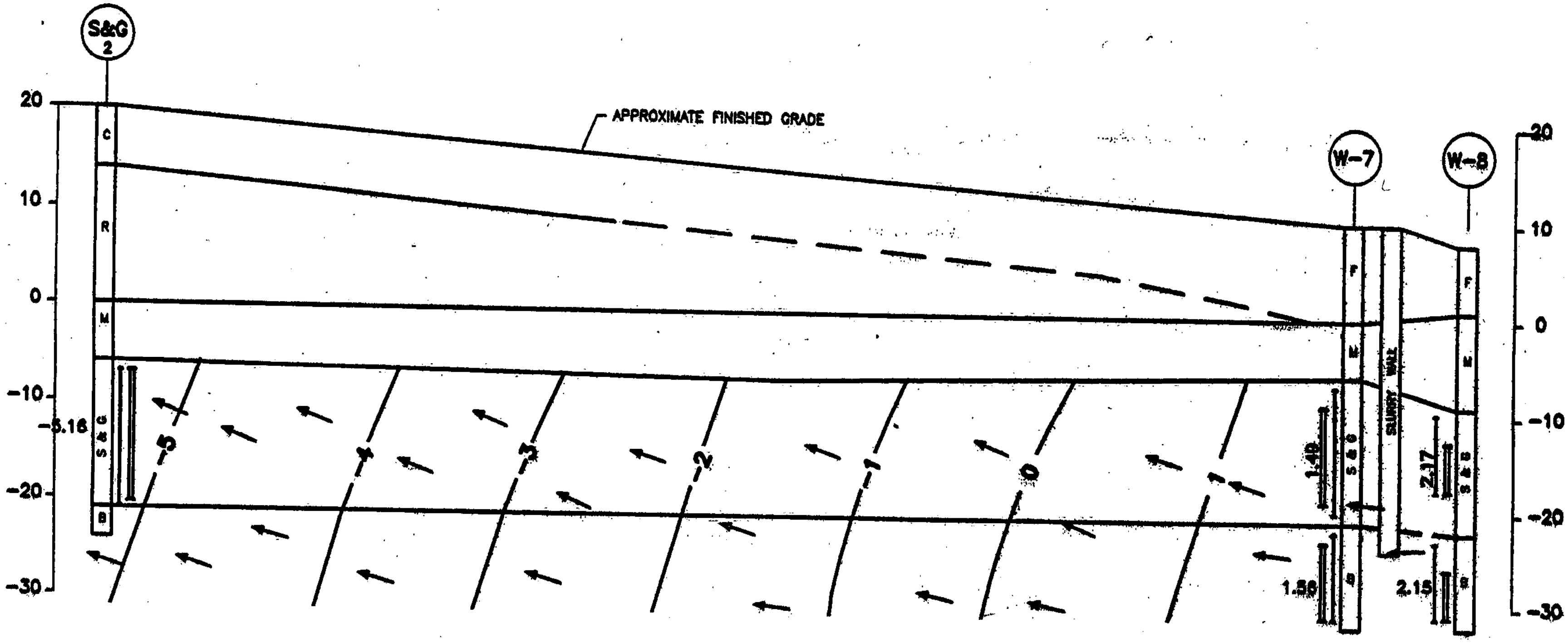


TRANSECT 4

SCALE: N.T.S.

LEGEND:

B – BEDROCK

C – CAP

R – REFUSE

M – MEADOW MAT

S & G – SAND & GRAVEL

1.49 ELEVATION OF WATER LEVEL IN MONITORING WELL, IN FEET MSL, 1/11/03

— –2 — GROUNDWATER EQUIPOTENTIAL IN BEDROCK AND SAND & GRAVEL, IN FEET MSL, 1/11/03

POTENTIAL VERTICAL DIRECTION OF GROUNDWATER FLOW.

SAND PACK INTERVAL

SCREENED INTERVAL

Shaw™

DATE ______
DWN ______
APP ______
REV ______
PROJECT NO.
791186

KIN-BUC LANDFILL
EDISON TOWNSHIP, EDISON, NEW JERSEY
MIDDLESEX COUNTY, NEW JERSEY
FIGURE 4
TRANSECT 4
HYDROGEOLOGIC CROSS SECTION ANALYSIS

Table 1
KinBuc Landfill Operable Units 1 and 2
Continuous Hydraulic Monitoring Results
Minimum/Maximum/Average Water Elevations

Inside Slurry Wall					Outside Slurry Wall				
Well ID	Monitoring Period	Minimum Recorded Water Elevation (ft)	Maximum Recorded Water Elevation (ft)	Average Water Elevation (ft)	Well ID	Monitoring Period	Minimum Recorded Water Elevation (ft)	Maximum Recorded Water Elevation (ft)	Average Water Elevation (ft)
W-1G	January	11.20	11.24	11.22	W-2G	January	11.31	13.87	12.31
W-3G	January	7.78	8.53	8.06	W-4G	January	11.16	12.23	11.57
W-3S	January	-0.56	1.77	0.46	W-4S	January	-1.23	3.08	0.52
W-5G	January	9.55	10.33	9.83	W-6G	January	13.10	14.27	13.54
W-5S	January	0.35	2.76	1.27	W-6S	January	0.46	2.90	1.37
W-7S	January	0.76	2.81	1.53	W-8S	January	1.71	5.70	2.37
W-15S	January	2.00	4.02	2.94	W-13S	January	1.28	4.08	2.00
W-15G	January	1.34	1.63	1.46	W-13G	January	3.04	4.24	3.77
W-9G	January	6.87	7.71	7.29	W-10G	January	8.03	8.33	8.20
W-3RR	January	-0.95	2.24	0.28	W-4R	January	-1.46	3.02	0.41

Table 1
KinBuc Landfill Operable Units 1 and 2
Continuous Hydraulic Monitoring Results
Minimum/Maximum/Average Water Elevations

Inside Slurry Wall					Outside Slurry Wall				
Well ID	Monitoring Period	Minimum Recorded Water Elevation (ft)	Maximum Recorded Water Elevation (ft)	Average Water Elevation (ft)	Well ID	Monitoring Period	Minimum Recorded Water Elevation (ft)	Maximum Recorded Water Elevation (ft)	Average Water Elevation (ft)
W-5R	January	NA (1)	NA (1)	0.74 (2)	W-6R	January	0.66	3.04	1.53
W-7R	January	0.83	2.86	1.60	W-8RR	January	1.67	5.84	2.34

Notes:
(1) Troll malfunctioned, data was not collected.
(2) Water elevation calculated from manual water levels.

Table 2
KinBuc Landfill Operable Unit 1
January/February 2003
Troll Water Elevations vs. Manual Water Elevations

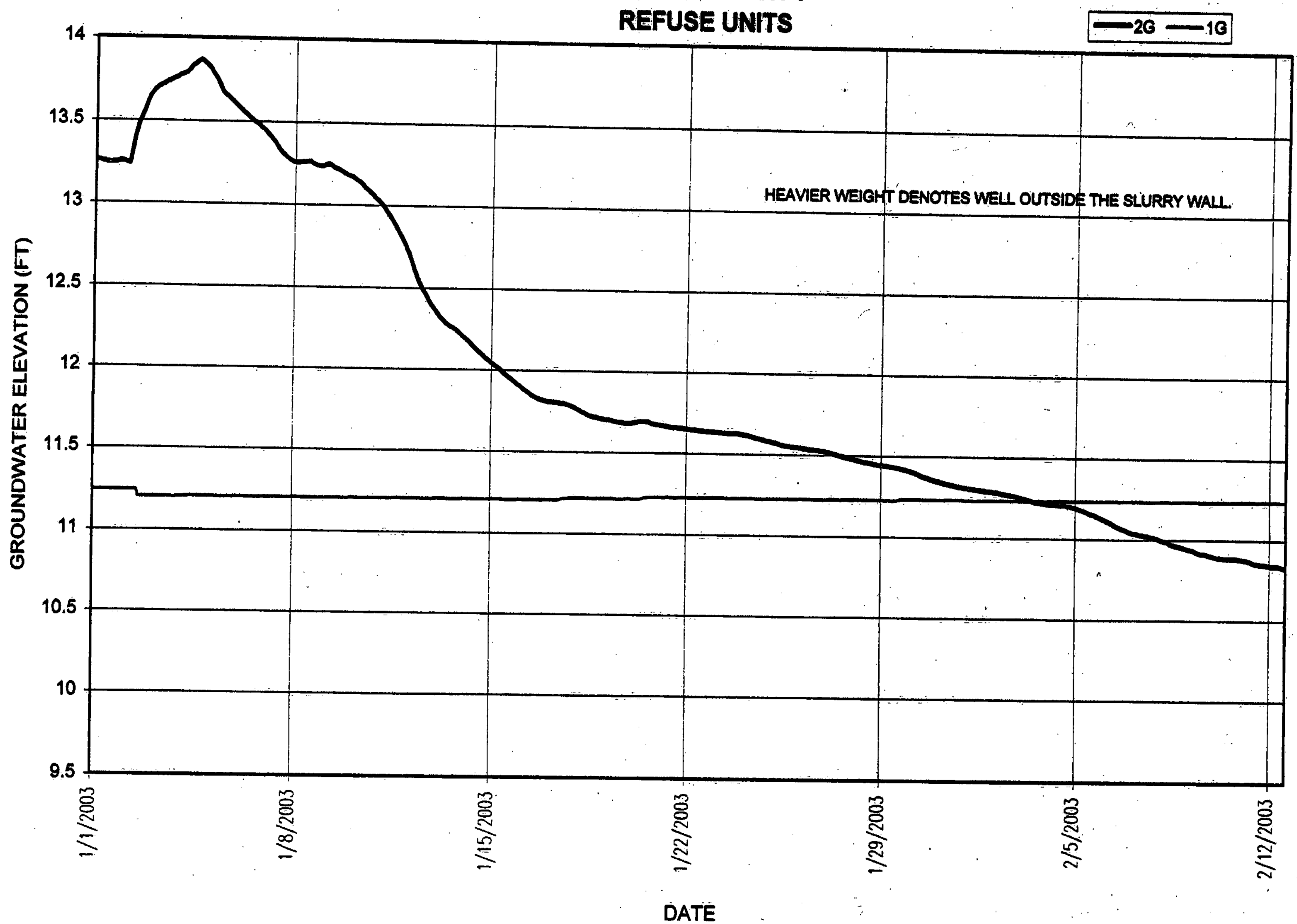
OU 1 Well ID	February 12, 2003		
	Troll	Manual	Difference
W-1G	11.26	11.25	0.01
W-2G	10.84	10.85	0.01
W-3G	7.93	7.88	0.05
W-3S	-0.04	-0.04	0.00
W-3RR	-0.61	-0.61	0.00
W-4G	11.15	11.14	0.01
W-4S	-0.53	-0.58	0.05
W-4R	-0.77	-0.84	0.07
W-5G	9.78	9.85	0.07
W-5S	0.87	0.88	0.01
W-5R	0.71	0.74	0.03
W-6G	13.43	13.45	0.02
W-6S	0.90	0.94	0.04
W-6R	1.05	1.06	0.01
W-7S	0.52	0.52	0.00
W-7R	0.62	0.61	0.01
W-8S	1.61	1.61	0.00
W-8RR	1.59	1.57	0.02
W-9G	7.00	7.02	0.02
W-10G	7.95	7.87	0.08
W-13G	6.39	6.30	0.09
W-13S	1.15	1.15	0.00
W-15G	1.42	1.42	0.00
W-15S	1.14	1.16	0.02

Table 3
Kin-Buc Landfill
Leachate Cleanout Monitoring
2003

Cleanout location	14N		14E		15N		15E		16N		16E	
Elevation @ Sea Level	22.87		22.77		26.51		26.51		31.36		31.32	
	depth to water	elevation	depth to water	elevation	depth to water	elevation	depth to water	elevation	depth to water	elevation	depth to water	elevation
Elevation Average		10.09		10.06		9.85		9.93		na		na
DATE												
12/10/2001	12.5	10.37	12.42	10.35	16.31	10.20	16.33	10.18	dry	na	dry	na
1/3/2002	12.37	10.50	12.31	10.46	16.21	10.30	16.22	10.29	dry	na	dry	na
2/13/2002	12.70	10.17	12.63	10.14	16.57	9.94	16.62	9.89	dry	na	dry	na
3/27/2002	12.61	10.26	12.55	10.22	16.52	9.99	16.47	10.04	dry	na	dry	na
4/19/2002	12.75	10.12	12.68	10.09	16.64	9.87	16.61	9.90	dry	na	dry	na
5/3/2002	13.03	9.84	12.96	9.81	16.97	9.54	16.94	9.57	dry	na	dry	na
6/5/2002	13.04	9.83	12.97	9.80	16.63	9.88	16.95	9.56	dry	na	dry	na
7/8/2002	12.86	10.01	12.79	9.98	16.77	9.74	16.72	9.79	dry	na	dry	na
8/2/2002	12.86	10.01	12.79	9.98	16.8	9.71	15.73	10.78	dry	na	dry	na
9/5/2002	12.86	10.01	12.78	9.99	16.77	9.74	16.75	9.76	dry	na	dry	na
9/26/2002	12.94	9.93	12.85	9.92	16.85	9.66	16.83	9.68	dry	na	dry	na
11/6/2002	12.64	10.23	12.58	10.19	16.59	9.92	16.48	10.03	dry	na	dry	na
12/6/2002	13.02	9.85	12.94	9.83	16.97	9.54	16.95	9.56	dry	na	dry	na
1/2/2003	13.07	9.80	13.00	9.77	17.03	9.48	17.01	9.50	dry	na	dry	na
2/12/2003	13.20	9.67	13.12	9.65	17.19	9.32	17.16	9.35	dry	na	dry	na

ATTACHMENT 1

KIN-BUC LANDFILL GROUNDWATER HYDROGRAPH #1
TRANSECT No. 1
REFUSE UNITS



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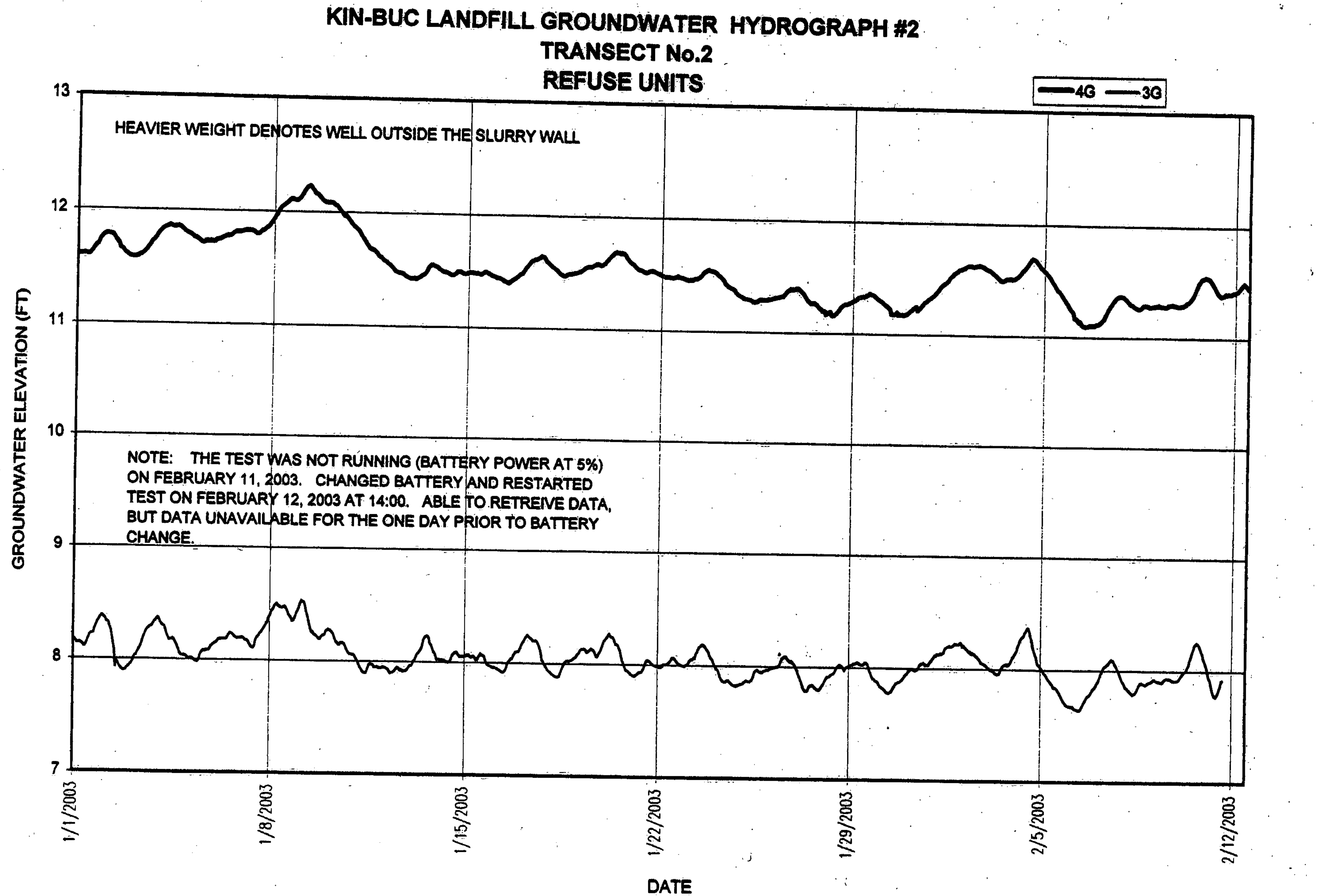

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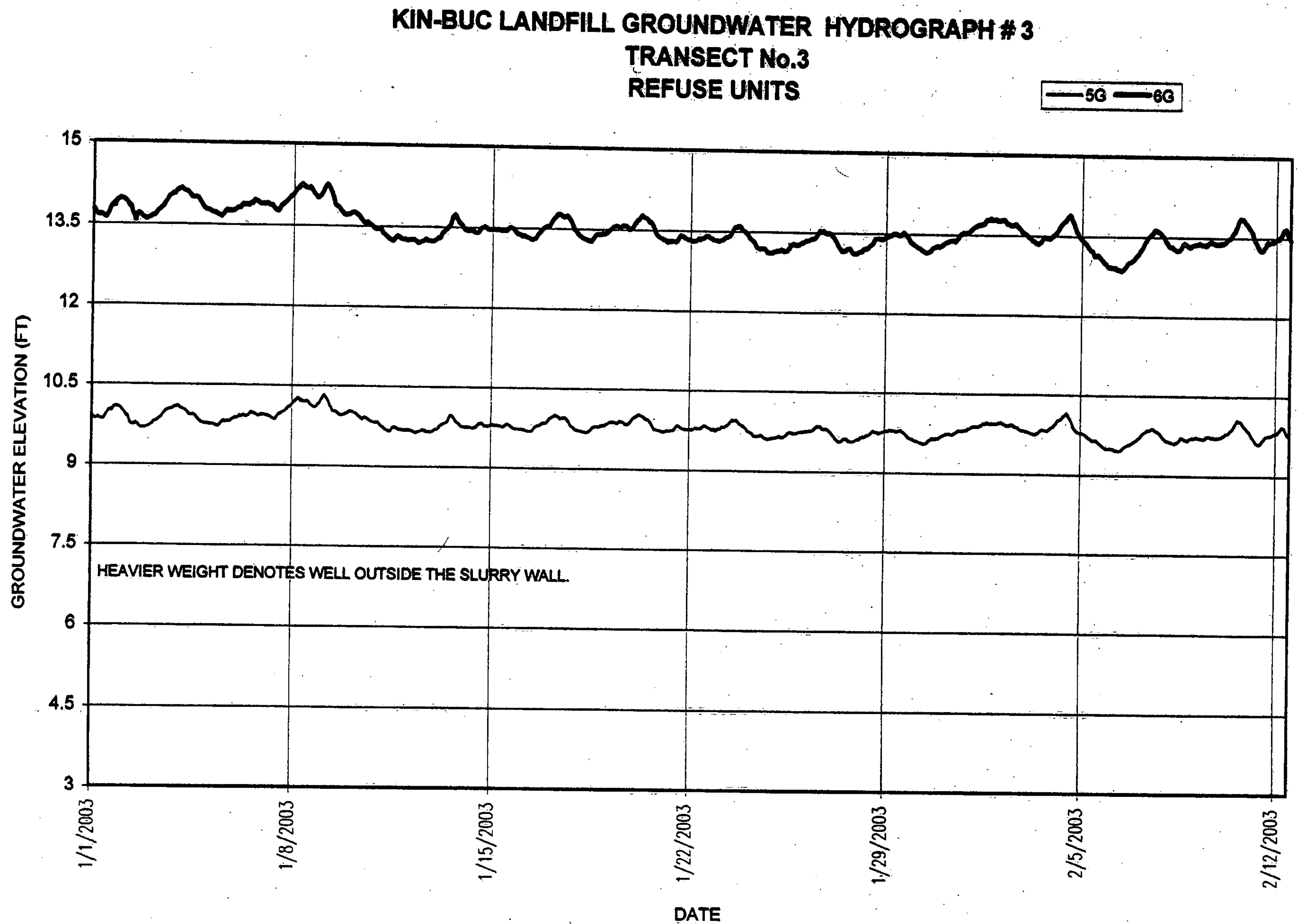

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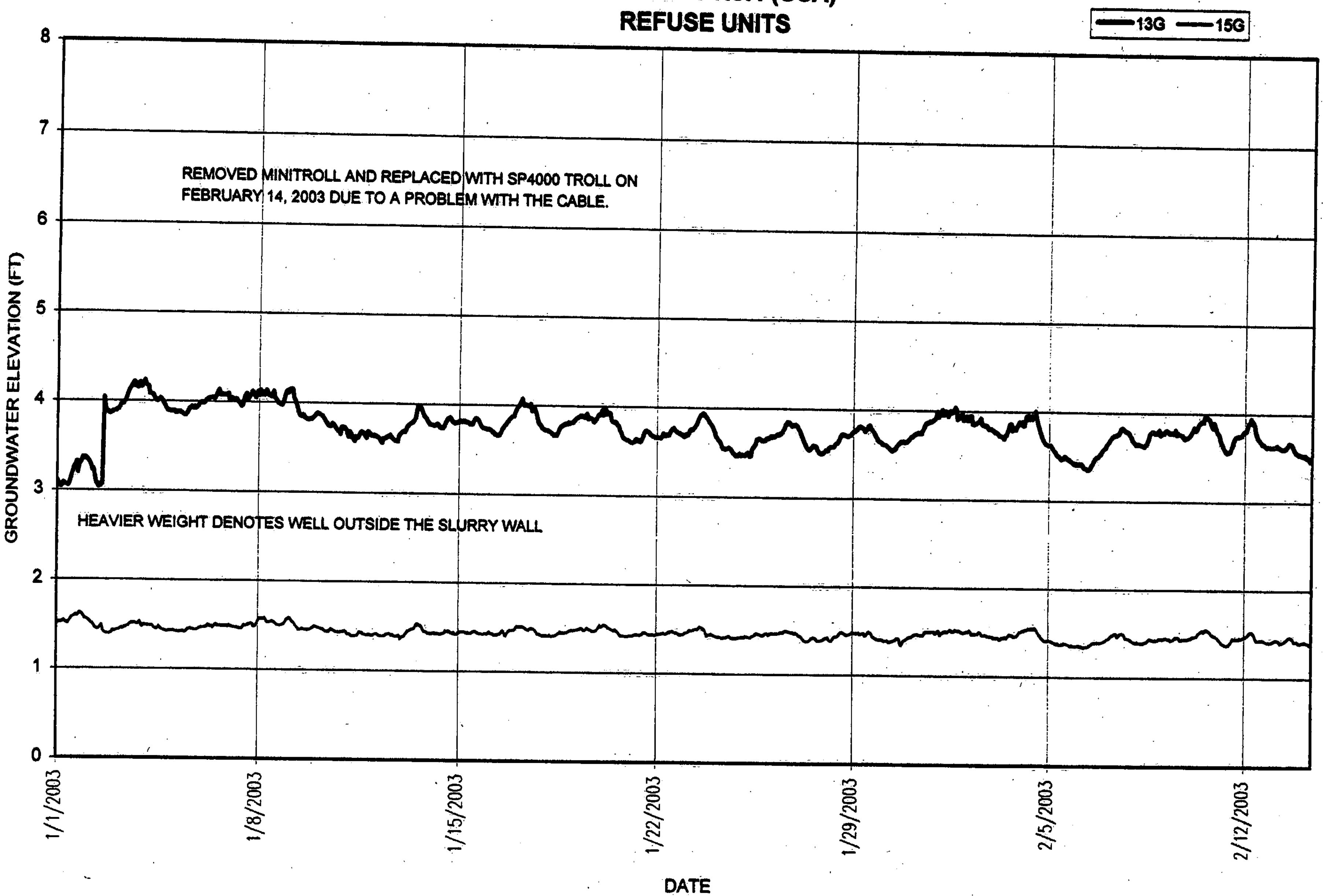
TRANSECT No.4 (OSA)
REFUSE UNITS



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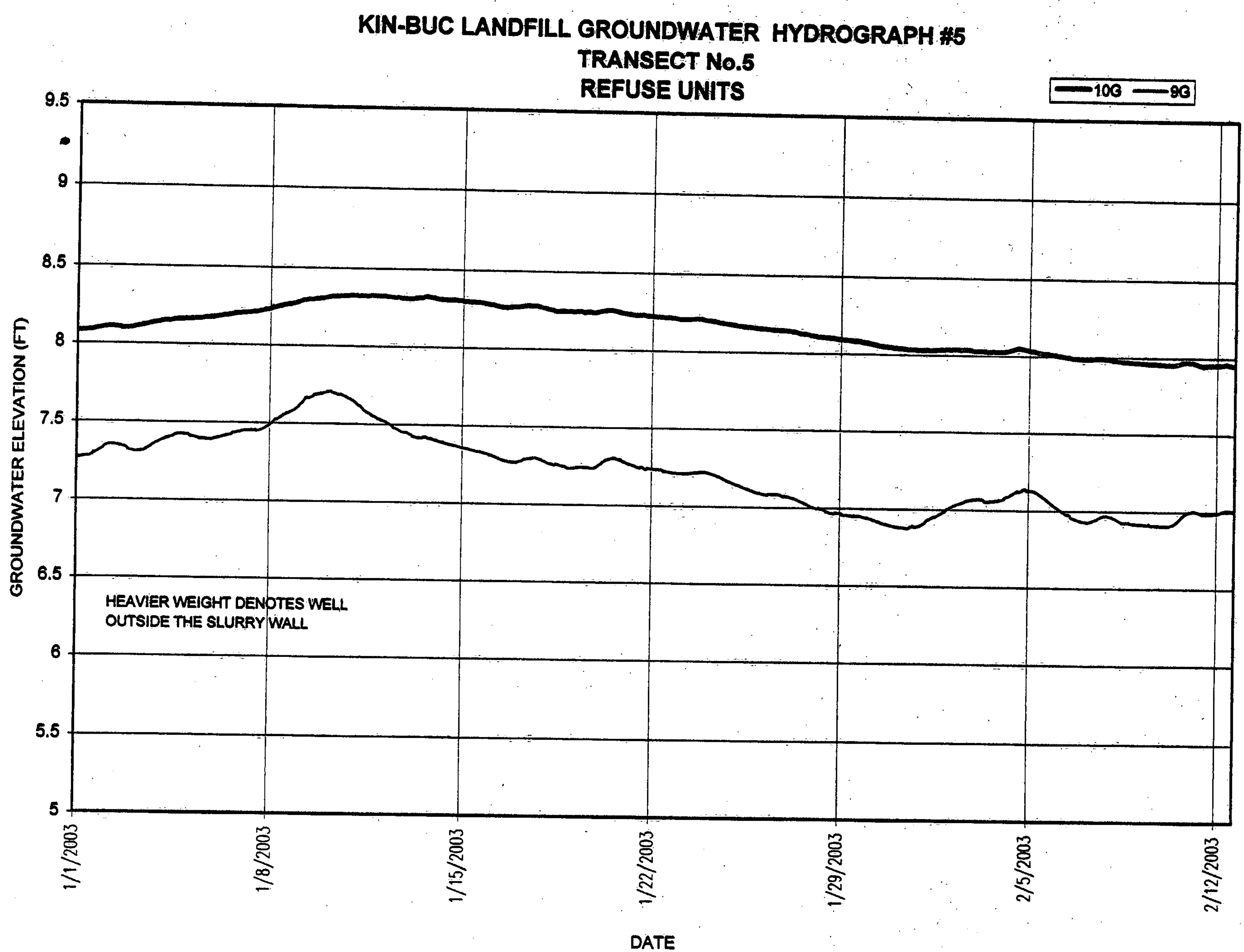

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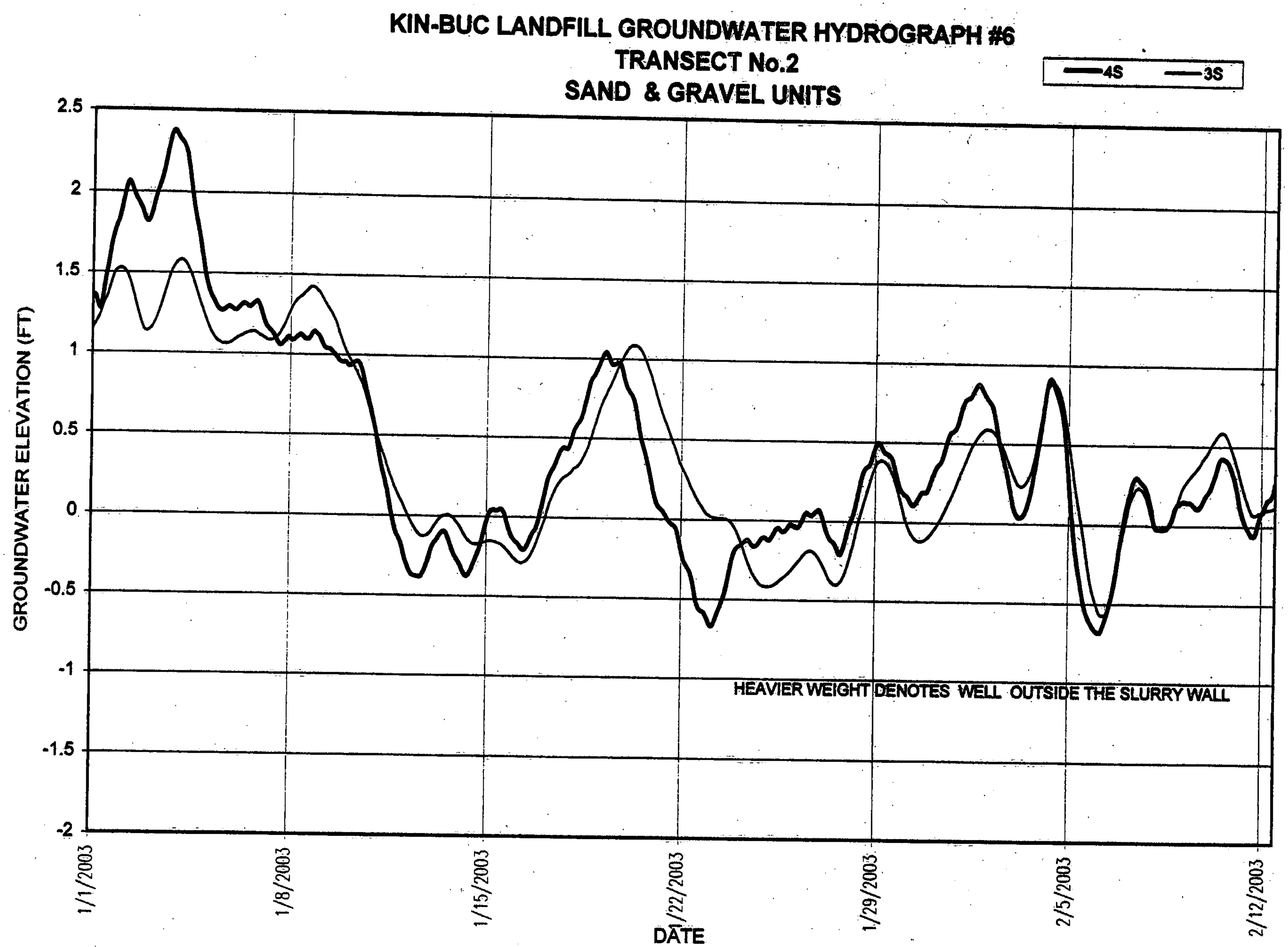

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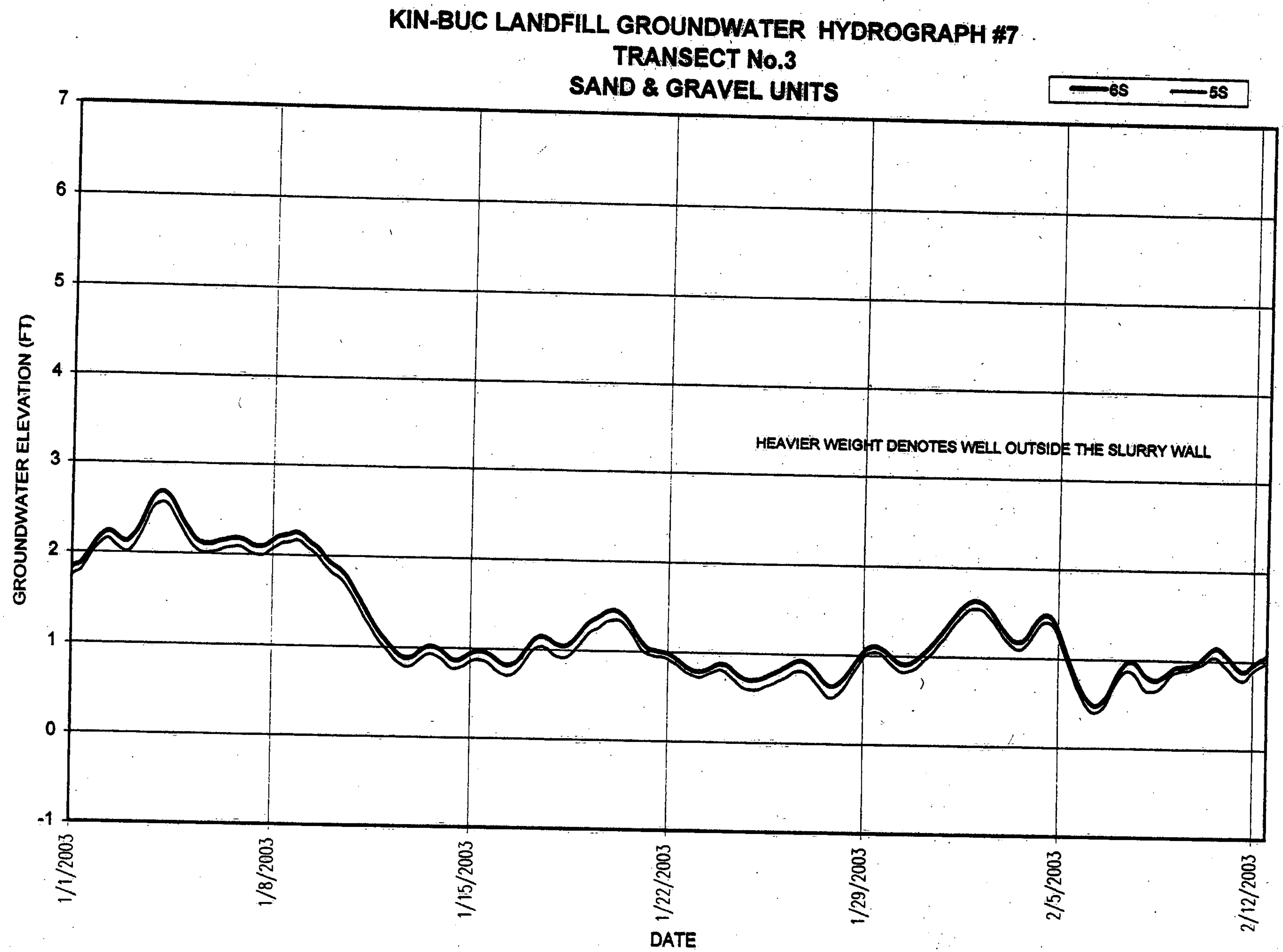

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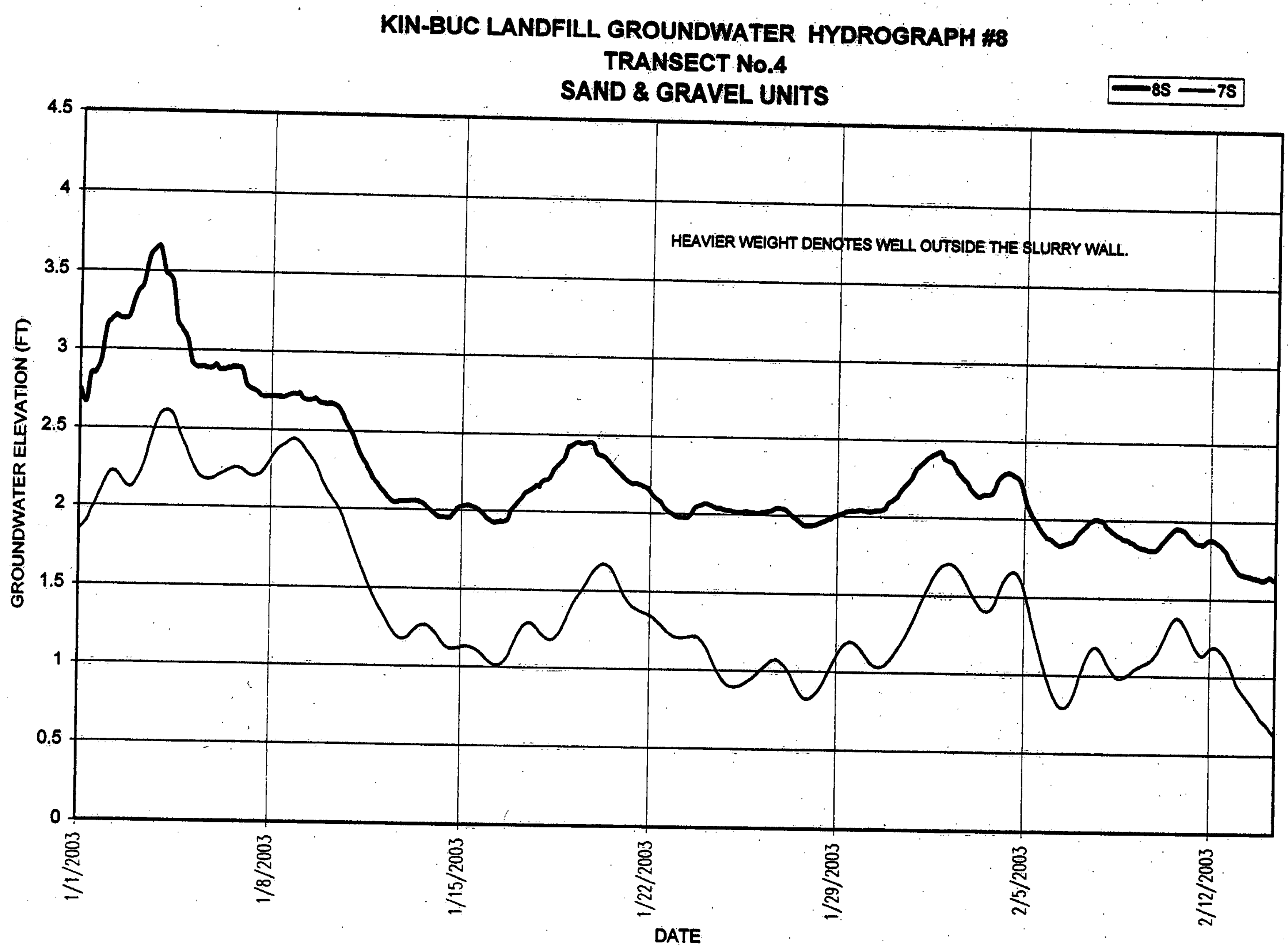

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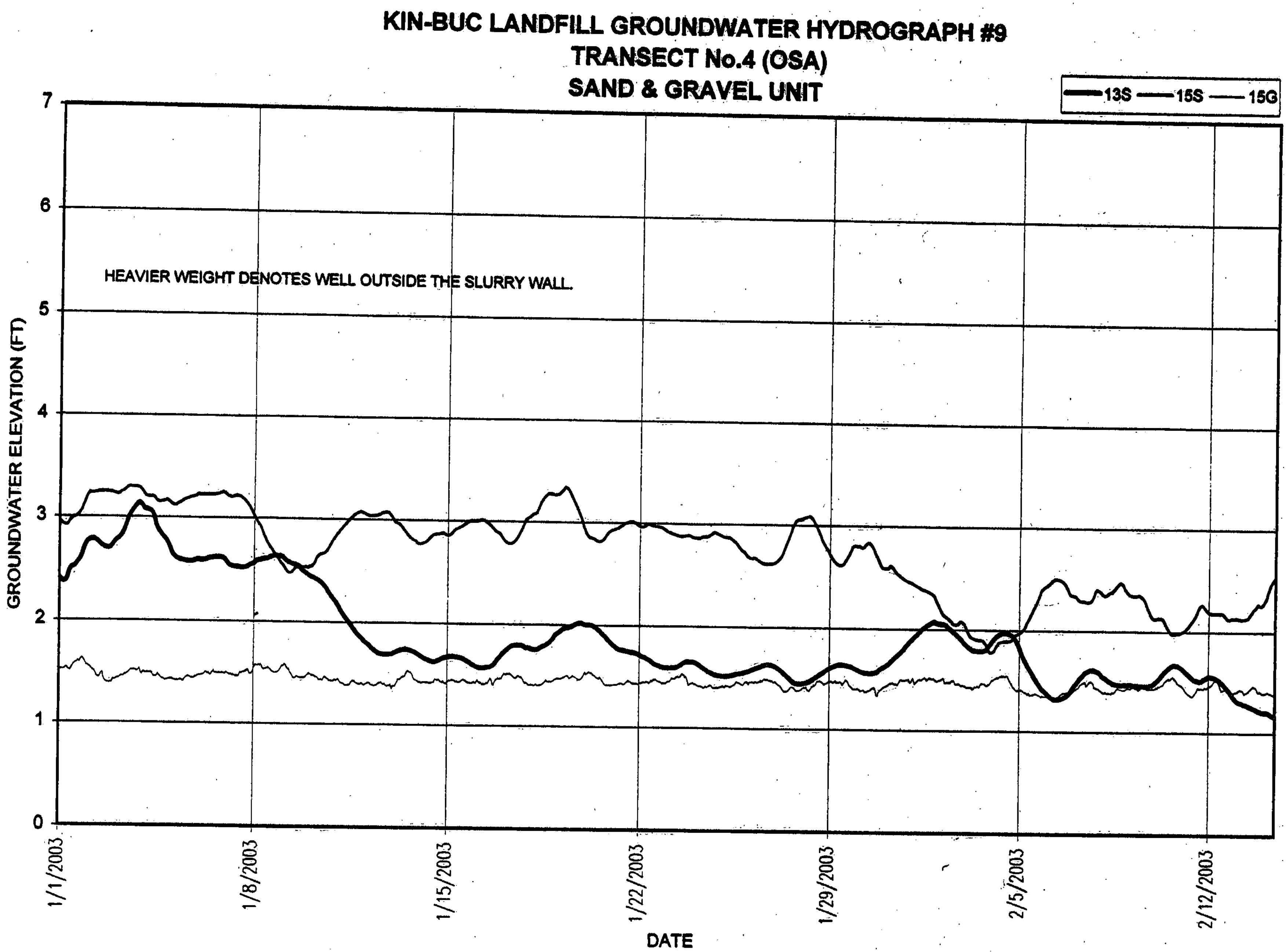

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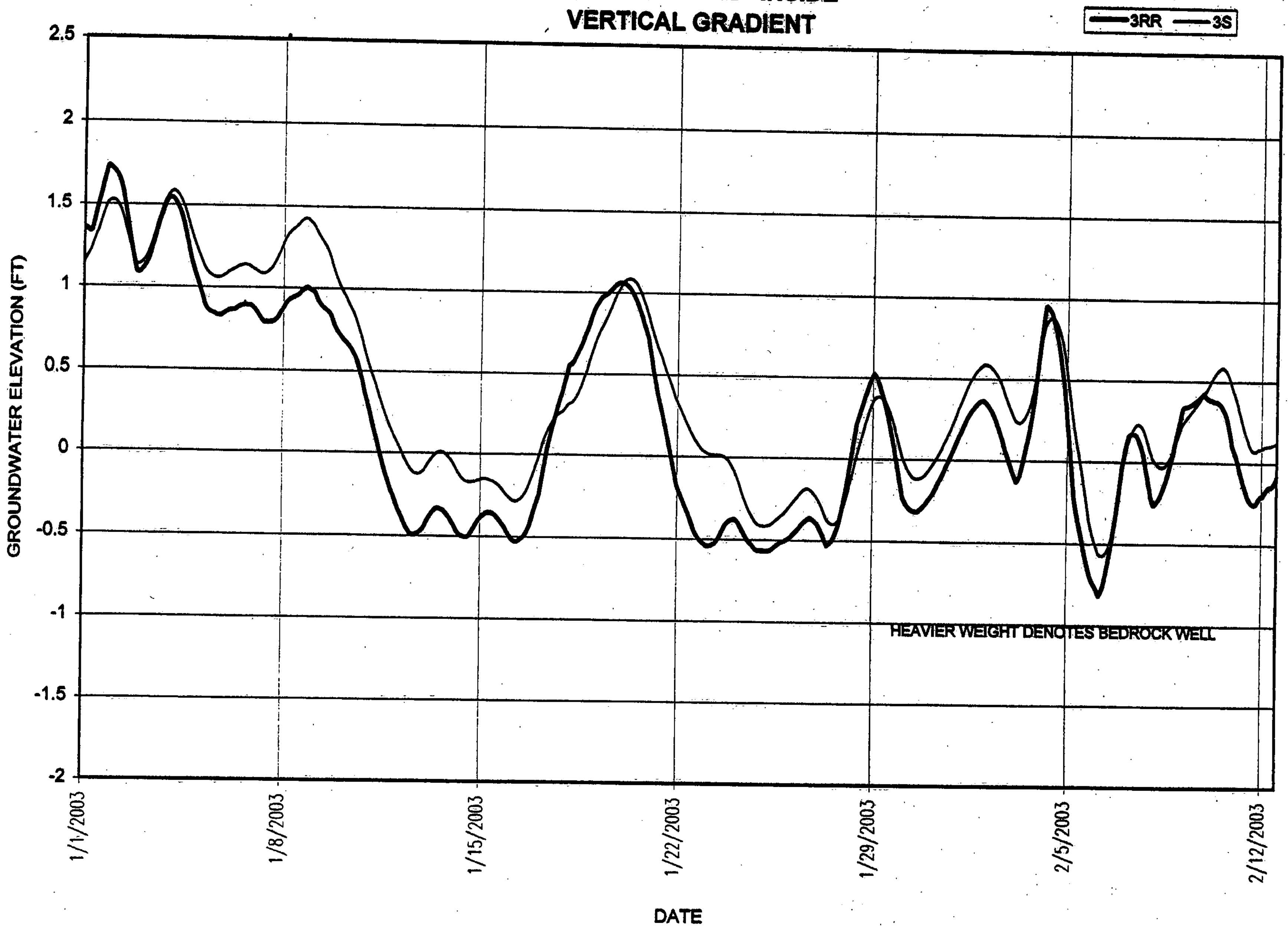
KIN-BUC LANDFILL GROUNDWATER HYDROGRAPH #10
TRANSECT No.2 - INSIDE
VERTICAL GRADIENT



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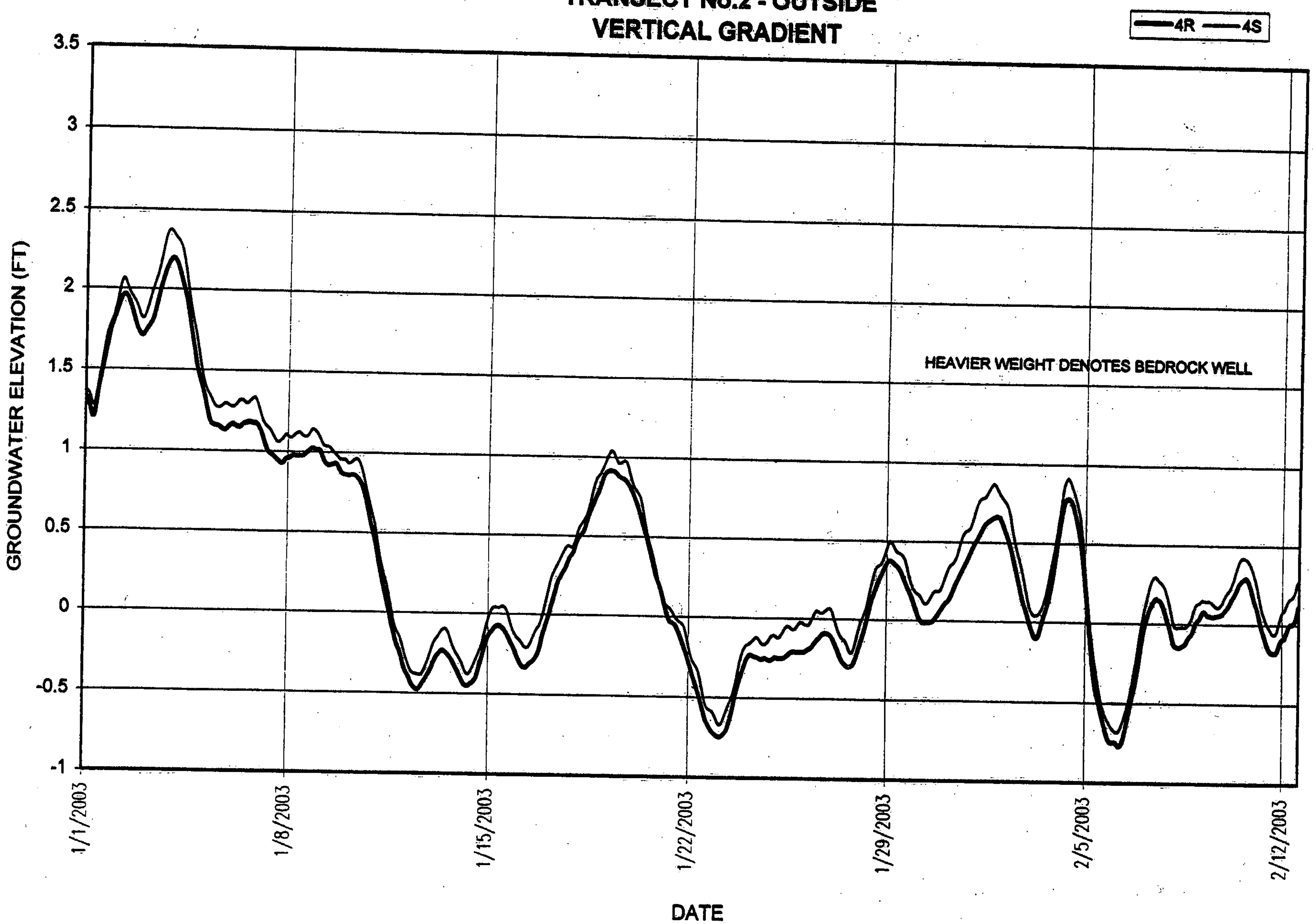
KIN-BUC LANDFILL GROUNDWATER HYDROGRAPH #11
TRANSECT No.2 - OUTSIDE
VERTICAL GRADIENT



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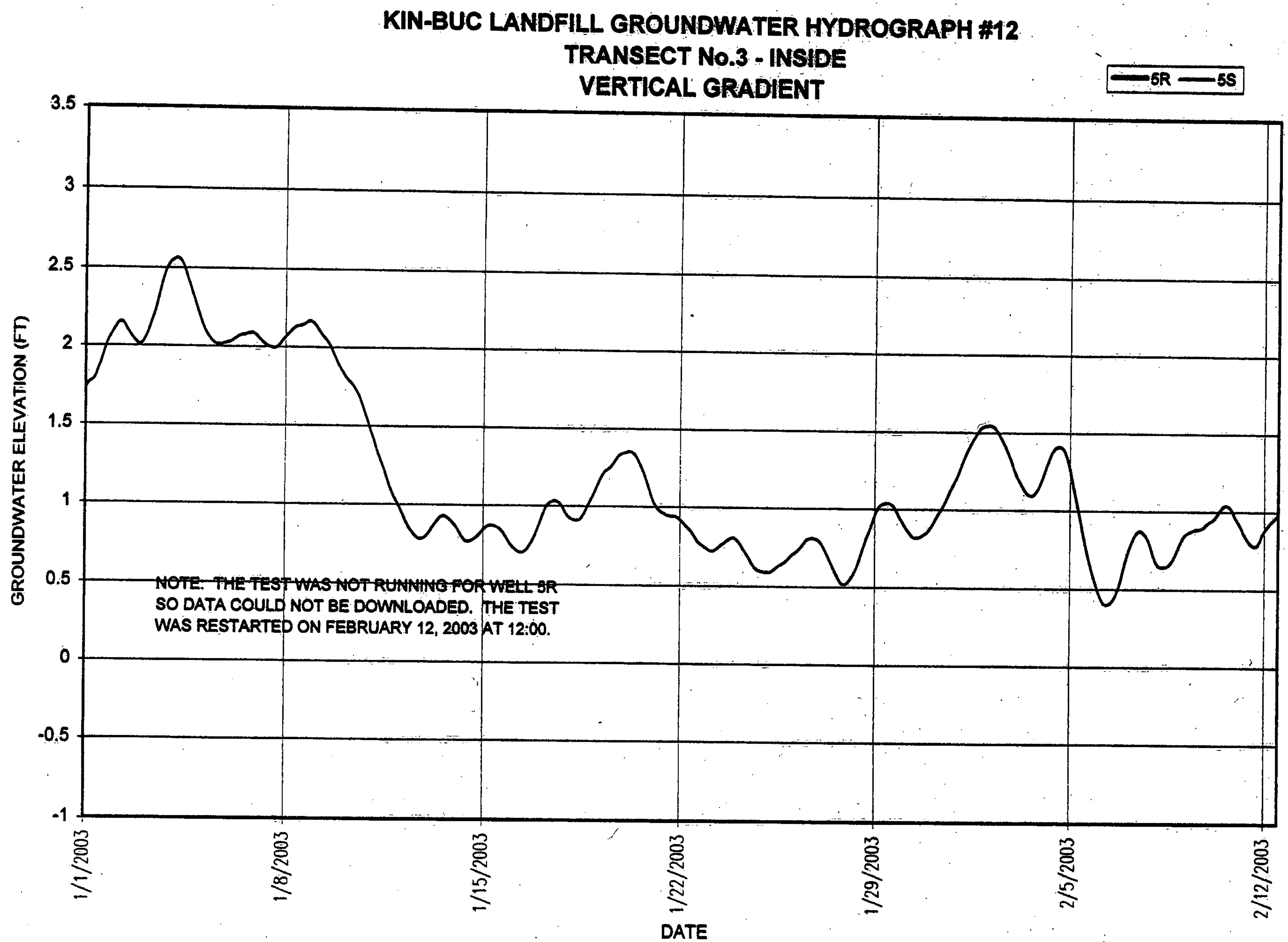

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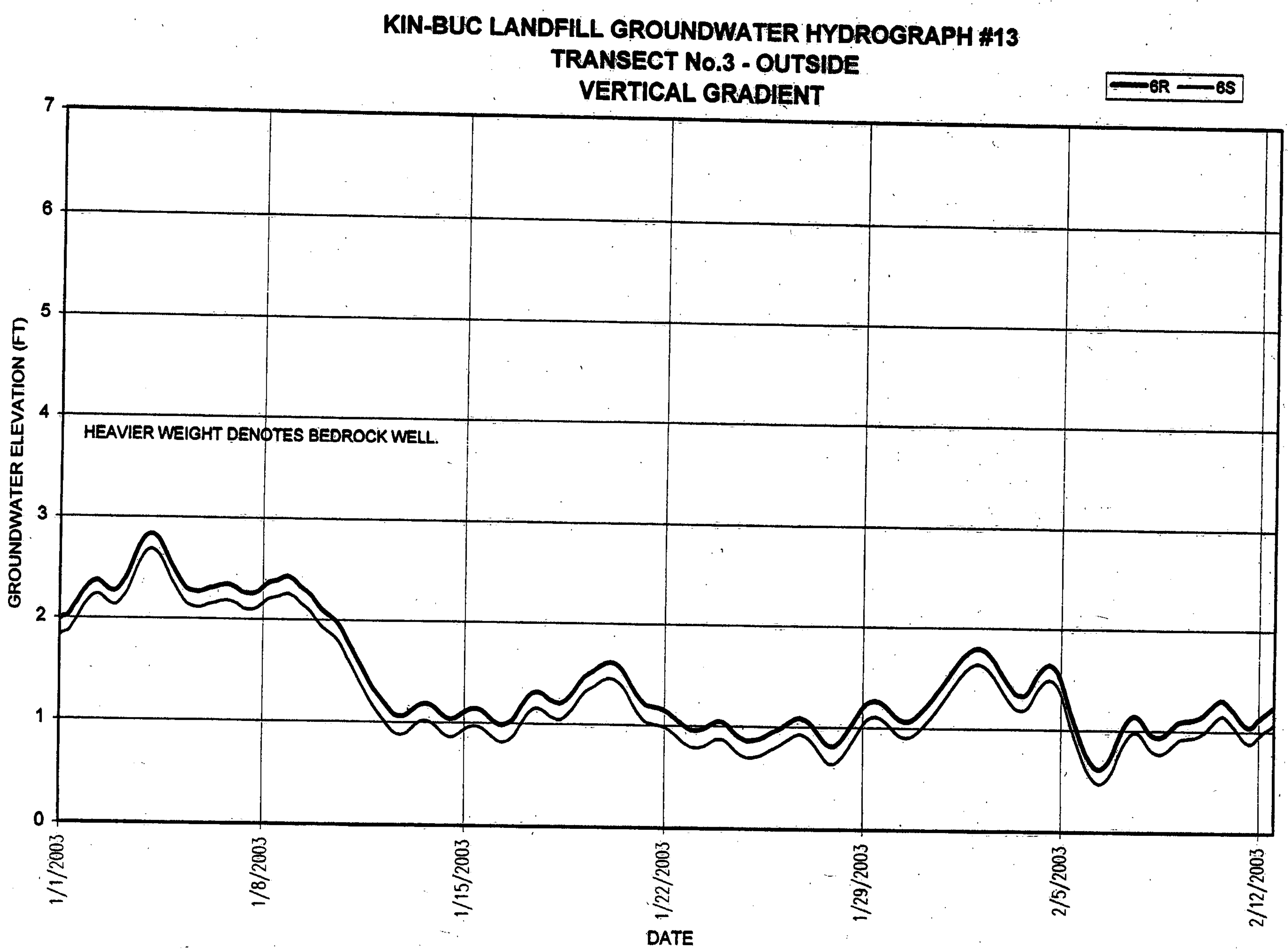

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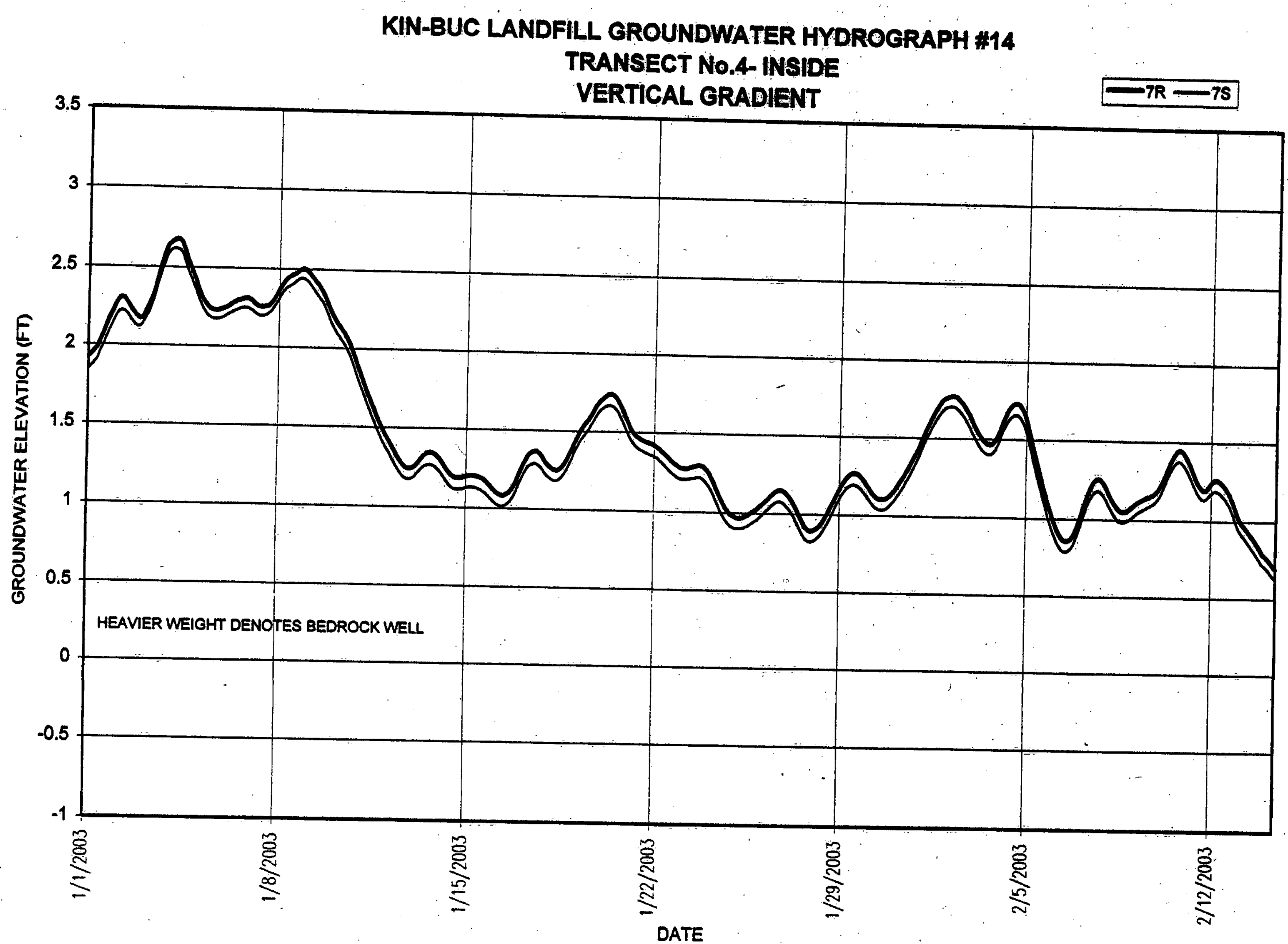

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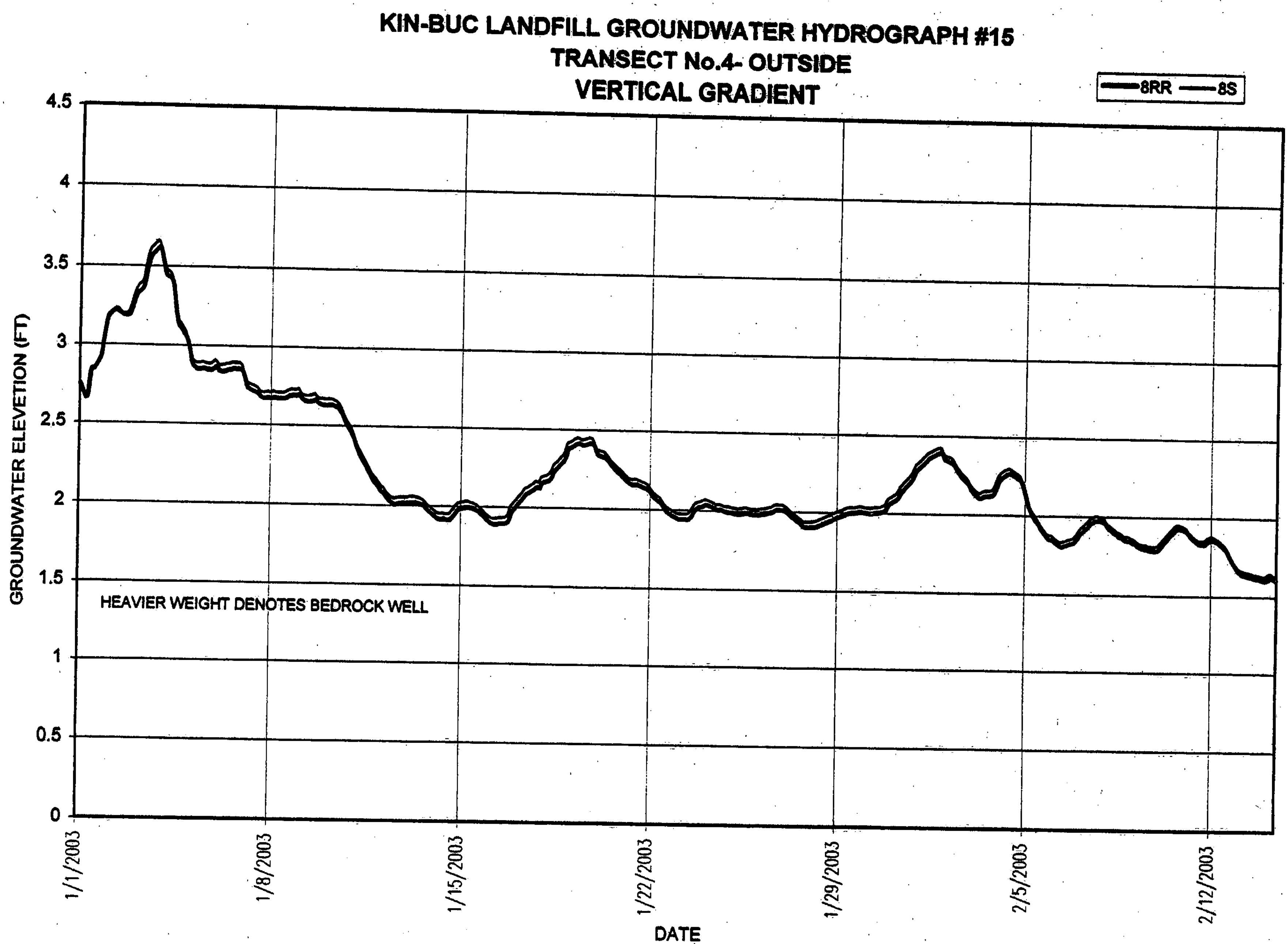


n://proj/kinbuc/15023500.000/1stqt01/Trans4Jan/8rr-8s

ATTACHMENT 2

the IT group

IT Corporation
Crossroads Corporate Center
One International Boulevard, Suite 700
Mahwah, NJ 07495-0086
Tel. 201.512.5700
Fax. 201.512.5786

A Member of The IT Group

June 27, 2001
Project 796201

Carl Januszkiewicz
Waste Management, Inc
Kin-Buc Landfill Treatment Plant
383 Meadow Road
Edison, NJ 08817

Re: Evaluation of Head Levels at Transect 1

Dear Mr. Januszkiewicz:

We have completed an evaluation of the hydraulic characteristics at Transect 1 with specific focus on the lack of intragradient conditions associated with the high water levels in W-1G (inside of the slurry wall) relative to those levels in W-2G (outside of the wall).

While intragradient conditions were evident at the outset of the hydraulic monitoring program in April 1996, these conditions have generally not been maintained. Specifically, based on a review of historical hydrographs, intragradient conditions were evident initially from approximately April to July 1996, and April to June 1997. Thereafter, to more recent events, intragradient conditions have been observed intermittently and for shorter periods of time.

Attachment 1 presents a hydrograph at Transect 1 encompassing the period from September 1998 to December 2000. As seen on the hydrograph, there were periods of time when intragradient conditions were not being maintained.

As opposed to the other "G" series monitoring wells that are located in refuse, wells 1G and 2G at Transect 1 are actually located in a silt and clay deposit. Attachment 2 contains the boring logs for these 2 installations. In-situ hydraulic conductivity testing performed at Transect 1 indicated permeabilities of 10^{-7} cm/sec and 10^{-5} cm/sec in W-1G and W-2G, respectively. Accordingly, a source of recharge to the overburden soils in the area of W-1G would not readily drain away, and therefore, higher heads could result.

Well 1G sampling events (November 1998, October 1999, October 2000) can be seen on the hydrograph as sharp vertical drops in groundwater levels. Due to the low permeability of the surrounding materials, the groundwater levels required several months to recover. Since the final cover extends 10 feet past the slurry wall, the source of the groundwater that is recharging W-1G is unknown at present.

The hydraulic gradient between W-1G and W-1R is vertically downward which rules out the bedrock as being a source of groundwater recharge. Based on a recent visual inspection of the area around Transect 1, the cap appears to be good condition and there were no signs that the cap integrity has been compromised.

Figure 1 depicts the conceptual model of the hydraulic interrelationship across Transect 1 showing water level measurements that depict the lack of intragradient conditions across the

slurry wall. The head levels in W-2G (outside the slurry wall) are generally at elevation 12 to 13 feet msl with periodic and short term increases to about 15 feet msl. The water level in the well sometimes falls below the level of the transducer. This is characterized by a flat straight line on the hydrographs as shown on Attachment 1. Head levels in W-1G (inside the slurry wall), on the other hand, are often greater with elevations as high as 15 to 16 feet msl being recorded.

It is evident from a review of Figure 1 that the drop in topography outside of the slurry wall toward Mill Brook, coupled with the higher permeability of W-2G relative to W-1G, would promote a more rapid decrease of head levels in the latter. This suggests that intragradient conditions may not be consistently attainable at this transect in any event. This notwithstanding however, and as depicted on Figure 1, it is important to note that the leachate collection system represents a hydraulic sink within the containment system. As such, groundwater in the vicinity of W-1G would drain toward the sink mitigating concerns of outward flow.

The leachate collection line runs parallel to the slurry wall and at its closest point is only about 20 feet away from Transect 1. Several cleanouts are located along the collection line with the closest, Cleanout 16, only about 65 feet from Transect 1. Leachate level measurements obtained from the cleanouts during December 2000 and June 2001 indicate a leachate level of 10 to 11 feet msl along the collection line as shown in Table 1. The leachate levels observed suggest that the leachate collection system is presently operating effectively.

Recommendations

Based on the above, it is recommended that during subsequent monitoring events at the site, measurements of leachate levels in Cleanouts 14 through 16 be recorded to verify that the leachate collection system is operating effectively. If liquid levels in the cleanouts increase above 12 to 13 feet msl, then maintenance of the collection line is recommended. Subsequent reports to EPA should include a discussion of the leachate collection system and its role as serving as a hydraulic sink within the containment system.

We trust you find this information useful. If you have any questions, please do not hesitate to contact us.

Sincerely,

IT Corporation

Steven Goldberg

Steven Goldberg, Ph.D, CPG
Senior Hydrogeologist

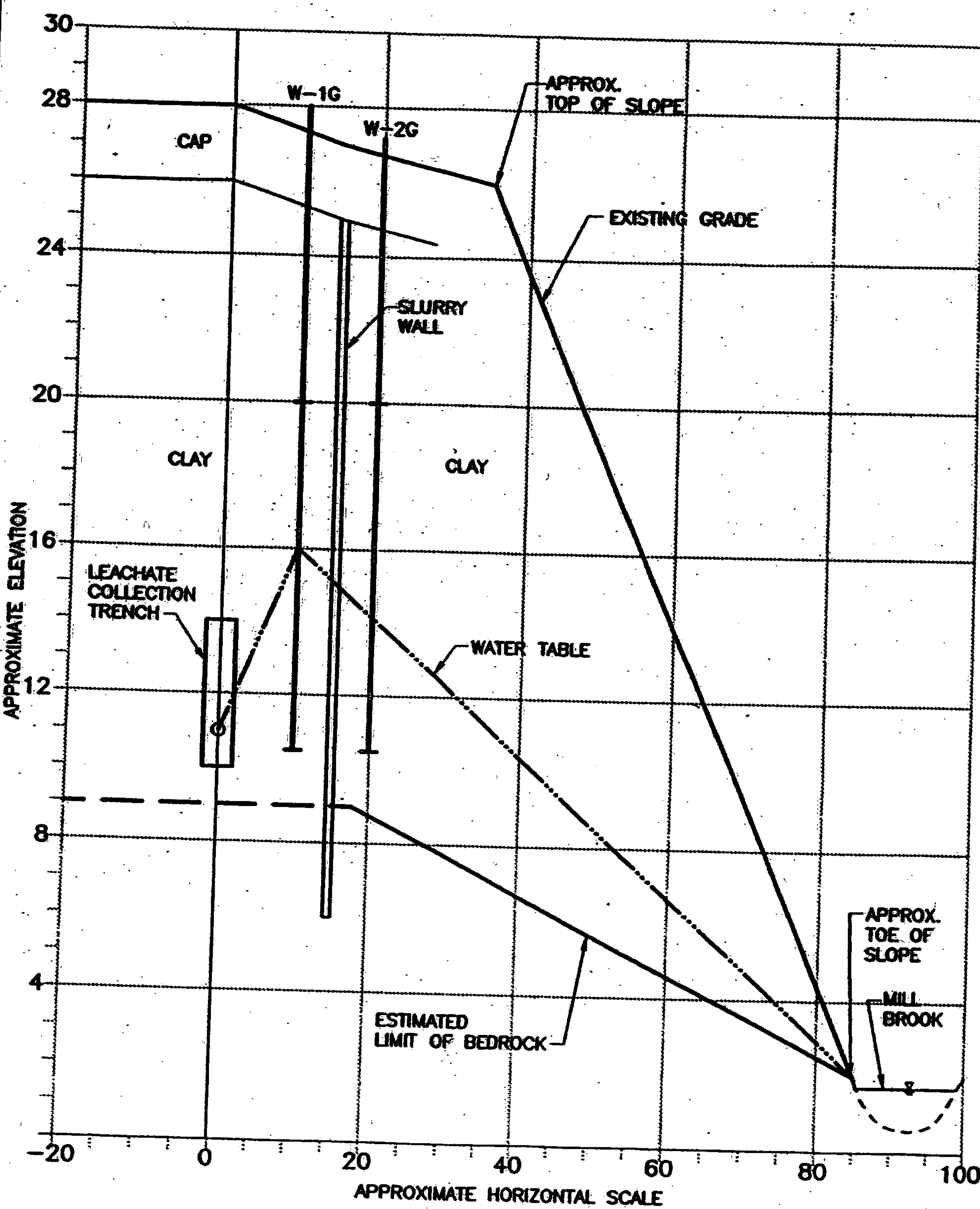
Thomas Connors

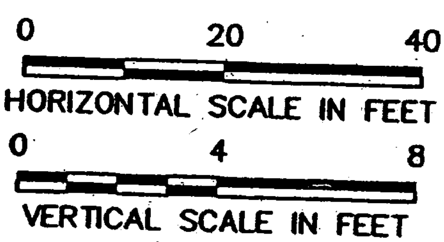
Thomas M. Connors, P.E.
Project Manager

Attachments

[redacted]aa\D[redacted]G\7[redacted]FIGUR[redacted]kbF-[redacted], Tue, [redacted]eb/01 10:29am [redacted]akinasian
Softdesk Project: N:\SDSK\PROJ\<none>   Dimscale: 1   Ltscale: 1   Psltscale: 1

IMAGE	X-REF	OFFICE	DRAWN BY	CHECKED BY	APPROVED BY	DRAWING NUMBER
---	---	Mahwah, NJ	A. Kinasian 2/2001	--	--	796201-A1





IT CORPORATION

WASTE MANAGEMENT INC.

FIGURE 1

CROSS SECTION TRANSECT 1

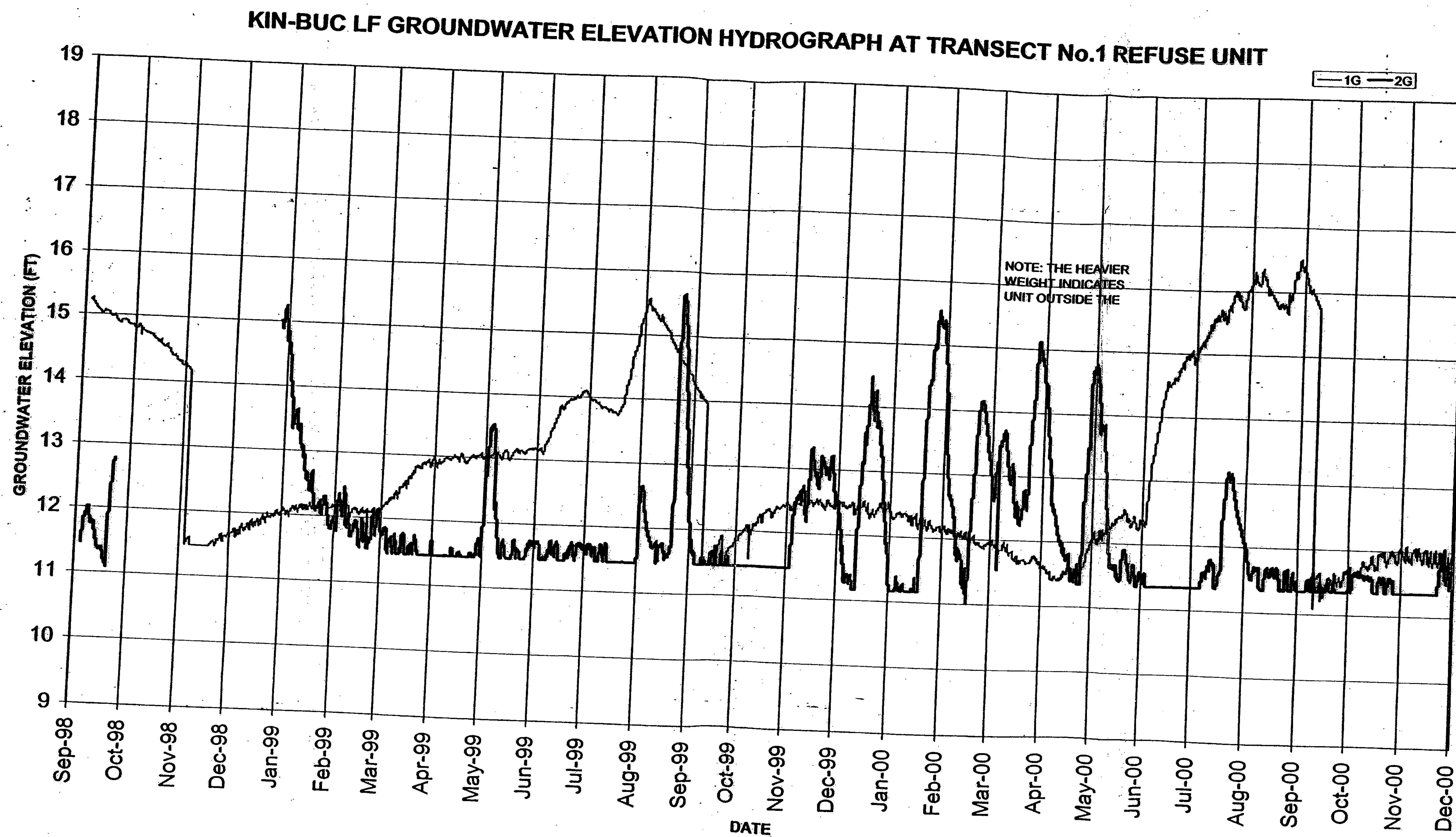
KIN-BUC LANDFILL
EDISON, NEW JERSEY

Table 1
Kin-Buc Landfill
Leachate Cleanout Monitoring
2001

Cleanout location	14N		14E		15N		15E		16N		16E	
Elevation @ Sea Level	22.87		22.77		26.51		26.51		31.36		31.32	
	depth to water	elevation	depth to water	elevation	depth to water	elevation	depth to water	elevation	depth to water	elevation	depth to water	elevation
Elevation Average		10.80		10.74		10.66		10.67				11.11
DATE												
6/7/01	11.98	10.89	12.02	10.75	15.86	10.65	15.87	10.64	dry	na	dry	na
5/16/01	12.25	10.62	12.23	10.54	15.96	10.55	15.96	10.55	dry	na	dry	na
4/26/01	12.36	10.51	12.35	10.42	15.99	10.52	16.01	10.50	dry	na	dry	na
3/21/01	11.80	11.07	11.75	11.02	15.62	10.89	15.59	10.92	dry	na	dry	na
2/26/01	12.03	10.84	11.94	10.83	15.95	10.56	15.92	10.59	dry	na	dry	na
1/29/01	12.08	10.79	11.98	10.79	15.85	10.66	15.83	10.68	dry	na	20.41	10.91
12/27/01	12.02	10.85	11.94	10.83	15.72	10.79	15.68	10.83	dry	na	20.01	11.31

N:proj\kinbuc\791186\monthlywaterlevels\cleanout levels.xls

ATTACHMENT 1



n:common\noel\yearKBGW\4 98 - 4 00

ATTACHMENT 2

MONITORING WELL RECORD

Well Permit No. 25 - 46506
Atlas Sheet Coordinates 25 : 45 : 428

OWNER IDENTIFICATION - Owner KIN-BUC INC.
Address 200 CENTENNIAL AVE.
City PISCATAWAY State NJ Zip Code

WELL LOCATION - If not the same as owner please give address. Owner's Well No. 2G
County MIDDLESEX Municipality EDISON TWP Lot No. 400 Block No. 5C
Address 383 Meadows Road, Edison, NJ

TYPE OF WELL (as per Well Permit Categories) MONITORING Date well completed 2 / 15 / 95
Regulatory Program Requiring Well CERCLA Case I.D. # NJD049860836
CONSULTING FIRM/FIELD SUPERVISOR (if applicable) Tele. #

WELL CONSTRUCTION

Total depth drilled 15.6 ft.
Well finished to 15 ft.
Borehole diameter:
Top 8 in.
Bottom 8 in.
Well was finished: [X] above grade [ ] flush mounted
If finished above grade, casing height (stick up) above land surface 4 ft.
Was steel protective casing installed? [ ] Yes [X] No

	Depth to Top (ft.) [From land surface]	Depth to Bottom (ft.)	Diameter (inches)	Type and Material
Inner Casing	+4	5	2	Sch 40 PVC
Outer Casing (Not Protective Casing)				
Screen (Note slot size)	5	15	2	Sch 40 PVC .010
Tail Piece				
Gravel Pack	3	15.6	8	#00 Ricci
Annular Seal/Grout	0	3	8	Bentonite slurry
Method of Grouting	tremie			

tatic water level after drilling - ft.
Water level was measured using -
Well was developed for N/A hours at N/A gpm
ethod of development N/A
Was permanent pumping equipment installed? [ ] Yes [X] No
mp capacity N/A gpm
Pump type: N/A
Drilling Method HSA
lling Fluid - Type of Rig B-61
Name of Driller Chad Chism
alth and Safety Plan submitted? [ ] Yes [X] No
vel of Protection used on site (circle one) None D C B A
I.J. License No. 0013753-001375
me of Drilling Company HARDIN-HUBER, INC.

GEOLOGIC LOG (Copies of other geologic logs and/or geophysical logs should be attached.)

0 - 15.6	red dry stiff clay, some silt

certify that I have drilled the above-referenced well in accordance with all well permit requirements and all applicable te rules and regulations.

Driller's Signature Chad Chism Date 2/15/95

COPIES: White - DEP Canary - Driller Pink - Owner Goldenrod - Health Dept.

DWR-138 M
11/94

NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF WATER ALLOCATION

MONITORING WELL RECORD

Well Permit No. 25 - 46505
Atlas Sheet Coordinates 25 : 45 : 428

OWNER IDENTIFICATION - Owner KIN-BUC INC
Address 200 CENTENNIAL AVE.
City PISCATAWAY State NJ Zip Code

WELL LOCATION - If not the same as owner please give address. Owner's Well No. 1G
County MIDDLESEX Municipality EDISON TWP Lot No. 400 Block No. 3C
Address 383 Meadows Road, Edison, NJ

TYPE OF WELL (as per Well Permit Categories) MONITORING Date well completed 2 / 15 / 95
Regulatory Program Requiring Well CERCLA Case I.D. # NJD049860836
CONSULTING FIRM/FIELD SUPERVISOR (if applicable) Tele. #

WELL CONSTRUCTION

Total depth drilled 15.6 ft.
Well finished to 15 ft.
Borehole diameter:
Top 8 in.
Bottom 8 in.
Well was finished: [X] above grade [ ] flush mounted
If finished above grade, casing height (stick up) above land surface ft.
Was steel protective casing installed? [ ] Yes [XX] No

	Depth to Top (ft.) [From land surface]	Depth to Bottom (ft.)	Diameter (inches)	Type and Material
Inner Casing	+4	5	2	Sch 40 PVC
Outer Casing (Not Protective Casing)				
Screen (Note slot size)	5	15	2	Sch 40 PVC .020
Tail Piece				
Gravel Pack	3	15.6	8	#2 Ricci
Annular Seal/Grout	0	5	8	Bentonite slurry
Method of Grouting	tremie			

Static water level after drilling - ft.
Water level was measured using -
Well was developed for N/A hours at N/A gpm
Method of development N/A
Was permanent pumping equipment installed? [ ] Yes [X] No
Pump capacity N/A gpm
Pump type: N/A
Drilling Method HSA
Drilling Fluid - Type of Rig B-61
Name of Driller Chad Chism
Health and Safety Plan submitted? [ ] Yes [X] No
Level of Protection used on site (circle one) None D C B A
N.J. License No. 0013753-001375
Name of Drilling Company HARDIN-HUBER, INC.

GEOLOGIC LOG (Copies of other geologic logs and/or geophysical logs should be attached.)

0 - 15.6	red gray dry stiff clay, some silt

I certify that I have drilled the above-referenced well in accordance with all well permit requirements and all applicable State rules and regulations.

Driller's Signature Chad Chism Date 2/15/95

COPIES: White - DEP Canary - Driller Pink - Owner Goldenrod - Health Dept.

EMCON/OWT, Inc.
One International Boulevard, Suite 700
Mahwah, NJ 07495-0086
201.512.5700
Fax 201.512.5786

Shaw™ EMCON/OWT, Inc.

April 3, 2003
Project 791186

Mr. Carl Januszkiewicz
Waste Management, Inc.
Kin-Buc Landfill Treatment Plant
383 Meadow Road
Edison, NJ 08817

Re: Hydraulic Monitoring for February 2003

Dear Mr. Januszkiewicz:

Site visits were completed on March 3, 2003 and March 4, 2003 to download the February water level recorder data and obtain manual water level measurements. The following is an update of the hydraulic monitoring for the month of February 2003 at the Kin-Buc Landfill. This information is to be included in the quarterly report, which is to be submitted to the EPA by mid-May 2003.

The minimum, maximum, and average water elevations recorded at each well are included in Table 1. Table 2 shows the troll water elevations versus the manual water elevations. The continuous water level elevation data when compared with manual readings indicated that the miniTrolls are functioning properly and are recording accurate data. However, the data supplied for well SG-1 showed the same water level for the period. The automated water level recording device in this well needs to be checked so that accurate readings can be obtained in the future

During the last site visit on February 12, 2003, several of the miniTrolls had little to no battery power at the time of the January monthly data downloads. As noted in the January letter, the original alkaline batteries in these miniTrolls were replaced with new alkaline batteries during the site visit on February 12, 2003. This included the miniTrolls in Wells 2G, 3G, 5R, 8S, 9G, 10G, 13S, and 15G.

A representative, Glenn Carlson, from In-Situ, Inc. was contacted regarding the low battery power in the miniTrolls. He recommended that the alkaline batteries be changed to lithium batteries. The lithium batteries last two to three times longer than alkaline and are able to withstand the cold temperatures (down to -40°F). The extreme cold would have caused the alkaline batteries to lose power quicker. During the site visits on March 3, 2003 and March 4, 2003, the alkaline batteries in each of the minTrolls were switched out for the new lithium batteries.

During the past few site visits, discoloration was observed on some of the miniTrolls including the miniTrolls in Wells 4R, 8S, and 10G. These minTrolls are slightly tarnished and have some rust around the ports. The condition of the miniTrolls is being monitored continuously.

There were no problems running the tests and downloading data during this site visit. The data for Well 5R begins on February 14, 2003 and continues forward throughout the month. There were problems with the miniTroll and the download during the last site visit and the test was restarted on February 14, 2003. The SP4000 Troll is still recording data in Well 13G.

Hydrographs have been prepared for each of the transect locations and are enclosed for your reference as Attachment No. 1. The water levels in wells on the outside of the slurry wall vary over the course of the day due to the tidal influence at the site. For clarity, Hydrograph Nos. 6 through 15 show the average water level in the well over a 24-hour period (12 hours before, and 12 hours after).

Refuse

As defined in the Record of Decision (ROD) for OU-1, the performance objective for the refuse unit calls for the pumping of leachate to establish inward gradients across the slurry wall with the additional benefit of reducing downward flow into the underlying sand and gravel unit. Based on the hydrographs the following is presented.

Transect 1-Refuse (1G/2G)/Hydrograph No. 1 - Intragradient conditions were not observed during the entire month of February. The average monthly water elevation for February at Well 1G (inside) and Well 2G (outside) was 11.25 and 11.06 feet msl, respectively. Water level elevation measurements taken from Leachate Collection Cleanouts Nos. 14 through 16 are included in Table 3, and indicate that the leachate collection system is functioning properly. The fact that the leachate collection system is functioning properly suggests significant capture of leachate. The evaluation of the hydraulic conditions in the refuse at Transect 1 is provided in Attachment No.2.

Transect 2-Refuse (3G/4G)/Hydrograph No. 2 – Intragradient conditions were maintained throughout the month of February. The average monthly water elevation for the month at Well 3G (inside) and Well 4G (outside) was 7.89 and 11.41 feet msl, respectively

Transect 3-Refuse (5G/6G)/Hydrograph No. 3 – Intragradient conditions were maintained throughout the month of February. The average monthly water elevation for the month of February at Well 5G (inside) and Well 6G (outside) was 9.72 and 13.52 feet msl, respectively.

Transect 4-Refuse Oil Seeps Area (13G/15G)/Hydrograph No. 4 – Intragradient conditions were maintained throughout the month of February. The average monthly water elevation for the month of February at Well 15G (inside) and Well 13G (outside) was 1.45 and 3.72 feet msl, respectively.

Transect 5-Refuse (9G/10G)/Hydrograph No. 5 – Intragradient conditions were maintained throughout the month of February. The average monthly water elevation for the month of February at Well 9G (inside) and Well 10G (outside) was 6.92 and 7.92 feet msl, respectively.

Sand and Gravel/Bedrock

For the sand and gravel unit, the performance objectives call for pumping of sand and gravel groundwater to prevent flow toward the slurry wall and to impose upward hydraulic gradients from the bedrock to the sand and gravel. An additional benefit would be the establishment of inward gradients across the slurry wall within the sand and gravel unit. The following is a description of the flow characteristics based on visual observation of the hydrographs.

<u>Horizontal Flow</u>
Transect 2-Sand and Gravel (3S/4S)/Hydrograph No. 6 – Intragradient conditions were not consistently maintained throughout the month of February. The average monthly water elevations for the month of February at Well 3S (inside) and Well 4S (outside) was -0.03 and 0.27 feet msl, respectively.

Transect 3-Sand and Gravel (5S/6S)/Hydrograph No. 7 – Slight intragradient conditions were maintained throughout the month of February. The average monthly water elevation for Well 5S (inside) and Well 6S (outside) was 0.97 and 1.08 feet msl, respectively.

Transect 4-Sand and Gravel (7S/8S)/Hydrograph No. 8- Intragradient conditions were maintained throughout the month of February. The average monthly water elevation for the month of February at Well 7S (inside) and Well 8S (outside) was 1.21 and 2.15 feet msl, respectively.

Transect 4 Sand and Gravel Oil Seeps Area (13S/15S)/Hydrograph No. 9 – Intragradient conditions were not evident during most of the month of February. The average monthly water elevation for the month of February at Well 15S (inside) and Well 13S (outside) was 2.03 and 1.76 feet msl, respectively. Water levels from Well 15G in the refuse unit are included on the hydrograph for comparison.

<u>Vertical Flow-Inside Slurry Wall</u>

Transect 2-Vertical Gradient (3S/3RR)-Inside/Hydrograph No.10 – Upward gradient conditions were not observed between the bedrock and overlying sand &

gravel units inside the slurry wall for most of the month of February. The average monthly water elevation for the month of February at Well 3S (sand & gravel) and Well 3RR (bedrock) was -0.03 and -0.06 feet msl, respectively.

Transect 3-Vertical Gradient (5R/5S)-Inside/Hydrograph No. 12 – Continuous water level recorder data is available for Well 5R beginning February 14, 2003. The data prior to February 14 could not be downloaded due to mechanical problems with the minTroll. The test was restarted during the last site visit on February 14, 2003. Upward gradient conditions were observed between the bedrock and overlying sand & gravel units inside the slurry wall for the month of February (2/14-3/4). The average monthly water elevation for the month of February at Well 5S (sand & gravel) and Well 5R (bedrock) was 0.97 and 1.08 feet msl, respectively.

Transect 4-Vertical Gradient (7R/7S)-Inside/Hydrograph No. 14 – Slight upward gradient conditions were observed between the bedrock and overlying sand & gravel units inside the slurry wall throughout the month of February. The average monthly water elevation for the month of February at Well 7S (sand & gravel) and Well 7R (bedrock) was 1.21 and 1.27 feet msl, respectively. The difference in average monthly water elevations was less than 0.1 feet.

Vertical Flow-Outside Slurry Wall

Transect 2-Vertical Gradient (4S/4R)-Outside/Hydrograph No. 11 – Upward gradient conditions were not observed between the bedrock and overlying sand & gravel units outside the slurry wall for the month of February. The average monthly water elevation for the month of February at Well 4S (sand & gravel) and Well 4R (bedrock) was 0.27 and 0.13 feet msl, respectively.

Transect 3-Vertical Gradient (6R/6S)-Outside/Hydrograph No. 13 – Upward gradient conditions were observed between the bedrock and overlying sand & gravel units outside the slurry wall for the month of February. The average monthly water elevation for the month of February at Well 6S (sand & gravel) and Well 6R (bedrock) was 1.08 and 1.23 feet msl, respectively.

Transect 4-Vertical Gradient (8RR/8S)-Outside/Hydrograph No. 15 – Upward gradient conditions were not observed between the bedrock and overlying sand & gravel units outside the slurry wall throughout the month of February. The average monthly water elevation for the month of February at both Well 8S (sand & gravel) and Well 8RR (bedrock) was 2.15 and 2.13 feet msl, respectively. The difference in average monthly water elevations for February was 0.02 feet, respectively.

An initial review of the hydrographs indicates that certain performance objectives associated with the sand and gravel and bedrock units may not be met, specifically associated with the uniform achievement of upward gradients from the bedrock to the overlying sand and gravel inside the wall (e.g. Hydrograph 10), and inward gradients across the slurry wall within the sand and gravel (Hydrographs 6 and 9). However previous investigations performed at the site would indicate that complete control of OU-1 groundwater can be achieved notwithstanding indications of downward flow from the sand and gravel to the bedrock, or outward flow across the slurry wall within the sand and gravel unit. This is based on the findings of the considerable pumping influence of the sand and gravel pumping wells, in particular S&G#2, in achieving hydraulic control at the site (see Groundwater Pumping Well Performance Evaluation Report, July 2000).

The influence of the pumping well can be demonstrated by review of a plan view groundwater contour map of the sand and gravel (Figure 1) and equipotential profiles and vector diagrams (Figures 1, 2, 3, and 4) that have been prepared. Initially, data was used from February 10, 2003. However, data showed that the extraction wells had been idle just prior to this date. The pumping was restarted just prior to the time where the data was taken. This resulted in the data used for the analysis not representing "static" conditions. The analysis was redone for a date after the pumping was continued for a period of time. Therefore, for this evaluation, a snapshot of groundwater elevations from the monitoring wells and pumping wells was obtained for February 16, 2003. At this time, S&G#2 was pumping at a rate of about 16 gallons per minute (gpm), while S&G#3 was pumping at a rate of 3 gpm. This resulted in a total of approximately 19 gpm or about 27,340 gallons per day. There was a downward vertical gradient observed the majority of the time between the sand and gravel and the bedrock inside and outside the slurry wall at Transect No.2 in February as evidenced by higher heads in the sand and gravel wells relative to bedrock wells. Periodically, there was also a higher head within the sand and gravel inside the slurry wall relative to the sand and gravel outside the slurry wall at Transect No. 2 in January.

Figures 1-4 incorporate the heads induced by pumping and show the considerable pumping influence of S&G#2. Specifically, groundwater flowing downward from the sand and gravel into the bedrock subsequently flows toward the pumping well. This occurs both inside and outside of the slurry wall. Also, groundwater within the sand and gravel unit flows toward the pumping well. The considerable pumping influence demonstrated at S&G#2, in conjunction with the fact that natural groundwater gradients in both the sand & gravel and bedrock flow predominantly towards the area of S&G#2, result in the complete capture of OU-1 groundwater at these pumping rates.

Groundwater and Leachate Collection

Based on data provided by U.S. Filter, the following volumes of groundwater and leachate were extracted from the sand & gravel wells and leachate collection system for the period from February 1 to February 28, 2003:

S&G No. 1 Groundwater	S&G No. 2 Groundwater	S&G No. 3 Groundwater	S&G No. 4 Groundwater	Leachate
0 gal.	557,504 gal.	60,604 gal.	8,370 gal.	43,343 gal.
0 gpd	19,911 gpd	2,164 gpd	299 gpd	1,548 gpd

For the month of February, a total of 626,478 gallons of groundwater was collected. The average daily groundwater extraction rate for all of the wells was 22,374 gpd. The extraction rate from S&G No. 2 was 19,911 gpd, the extraction rate from S&G No. 3 was 2,164 gpd, and the extraction rate from S&G No. 4 was 299 gpd. The leachate extraction rate was 1,548 gpd for the month of February.

CONCLUSIONS

- Intragradient conditions were maintained in the refuse unit at Transects 2, 3, 4, and 5.
- Intragradient conditions were not maintained throughout the month of February by the monitoring wells at Transect 1, although levels in the leachate collection system indicate intragradient conditions are present at this location.
- Hydraulic control was maintained within OU-1 based on the analysis of the significant influence of S&G#2 in acting as a hydraulic sink for sand and gravel and bedrock groundwater. Groundwater flow in the sand and gravel and bedrock is ultimately captured by the pumping wells (S&G#2 and S&G#3) resulting in overall containment of groundwater in OU-1.
- In view of the analysis presented herein, it is recommended that the combined groundwater pumping rates in the sand and gravel be maintained at 15,000 gpd with S&G#2 and S&G#3 pumping at 10,000 gpd and 5,000 gpd, respectively. These lower pumping rates will be evaluated to confirm continued hydraulic control of OU-1 groundwater.

We trust you find this information useful. If you have any questions, please do not hesitate to contact us.

EMCON/OWT, INC.

Timothy S Pagano

Tim Pagano, CPG
Senior Hydrogeologist

Laura Kisala

Laura Kisala
Environmental Scientist

Attachments

cc: Glenn Grieb, US Filter
Steve Golberg, EMCON/OWT, Inc.

1" 1/2" 0"

IMAGE Files: <No Images>
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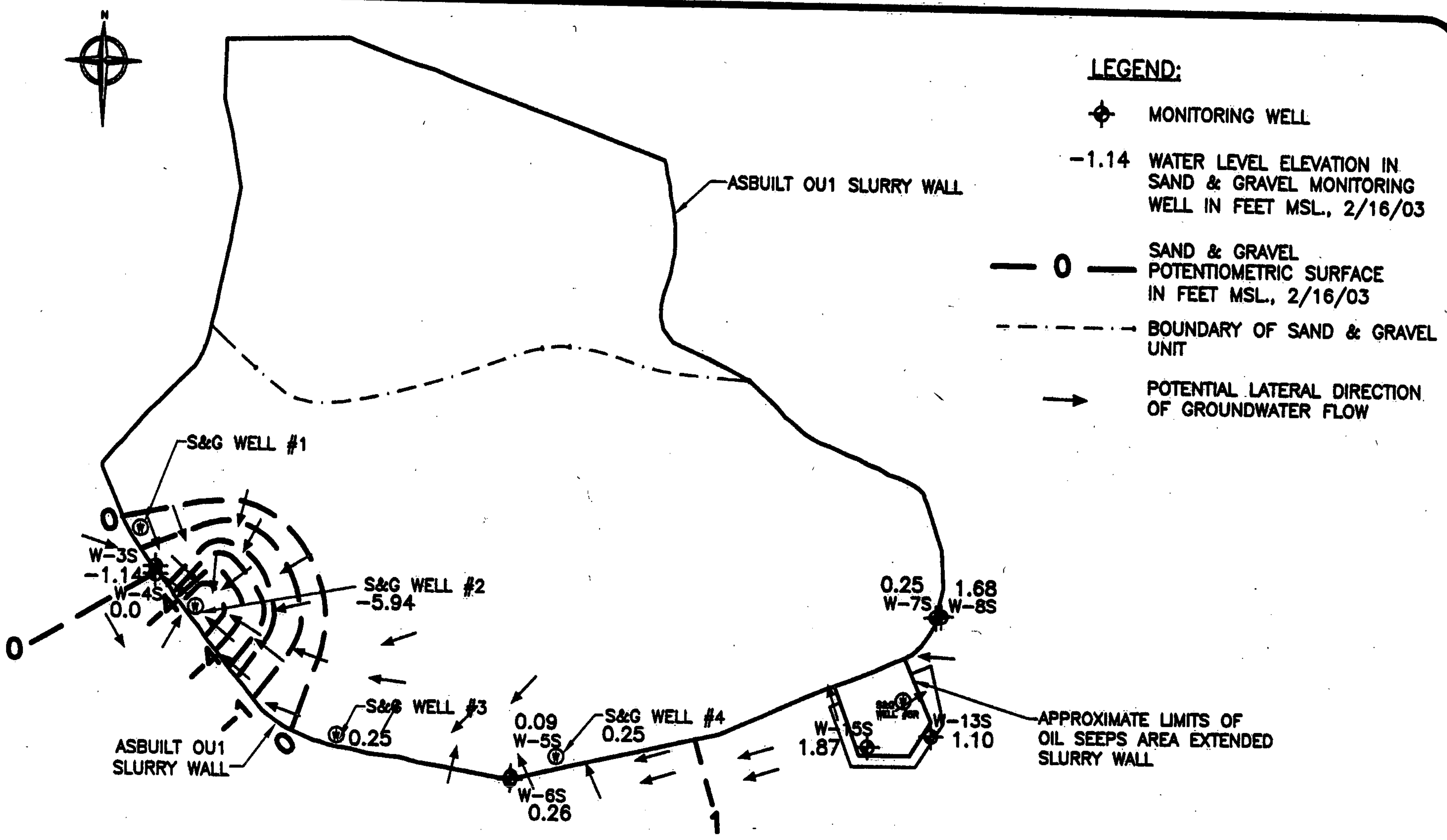

Shaw

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SCALE IN FEET

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APP
REV
PROJECT NO.
791186

KIN-BUC LANDFILL
EDISON TOWNSHIP, EDISON, NEW JERSEY
MIDDLESEX COUNTY, NEW JERSEY

FIGURE 1
SAND & GRAVEL UNIT POTENTIOMETRIC SURFACE

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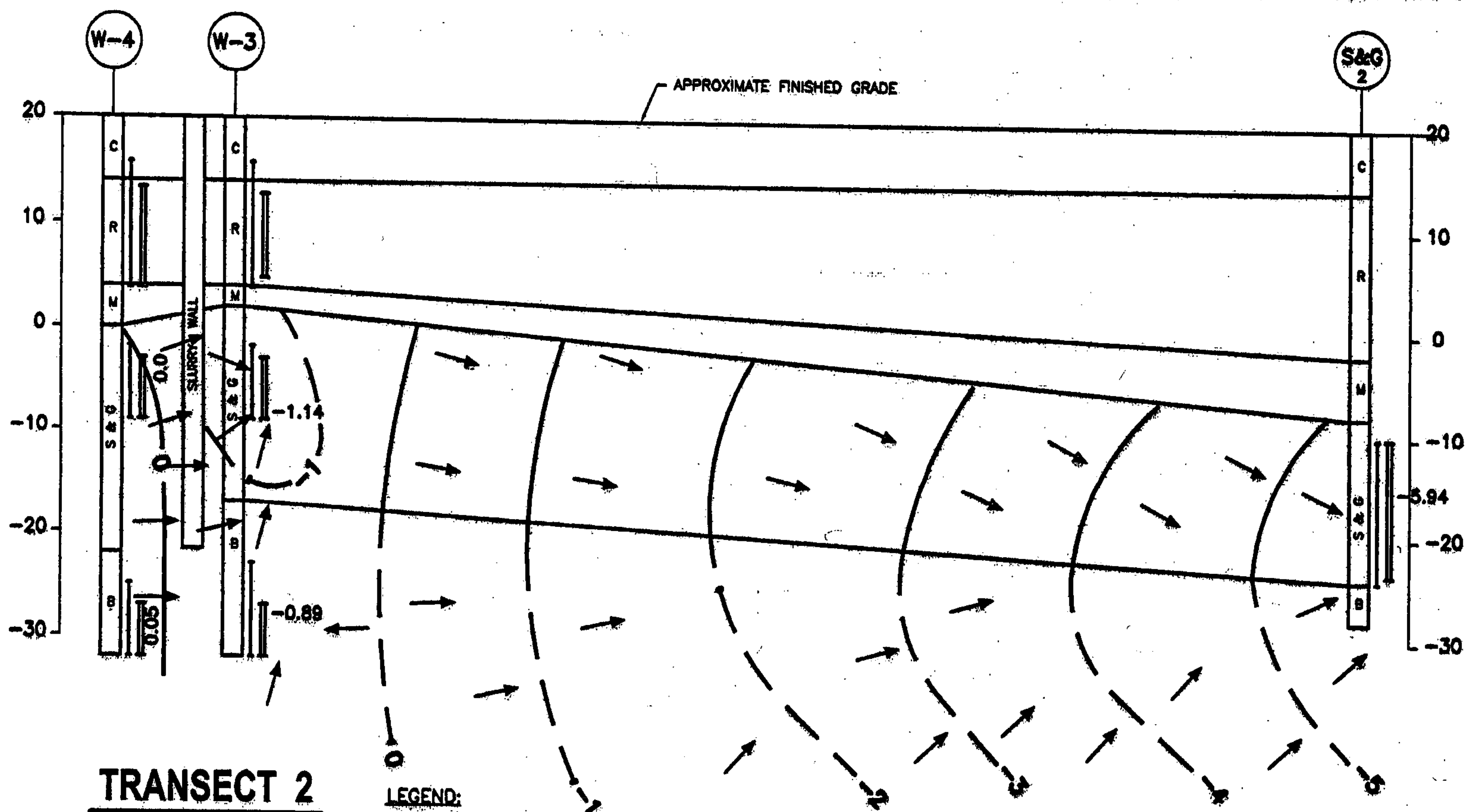

TRANSECT 2

SCALE: N.T.S.

LEGEND:

B	– BEDROCK	0.05	ELEVATION OF WATER LEVEL IN MONITORING WELL, IN FEET MSL., 2/16/03
C	– CAP		
R	– REFUSE	— 1 —	GROUNDWATER EQUIPOTENTIAL IN BEDROCK AND SAND & GRAVEL, IN FEET MSL., 2/16/03
M	– MEADOW MAT		
S & G	– SAND & GRAVEL	→	POTENTIAL VERTICAL DIRECTION OF GROUNDWATER FLOW.

SAND PACK INTERVAL

SCREENED INTERVAL

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KIN-BUC LANDFILL
EDISON TOWNSHIP, EDISON, NEW JERSEY
MIDDLESEX COUNTY, NEW JERSEY

FIGURE 2

TRANSECT 2
HYDROGEOLOGIC CROSS SECTION ANALYSIS

IMAGE Files: <No images>
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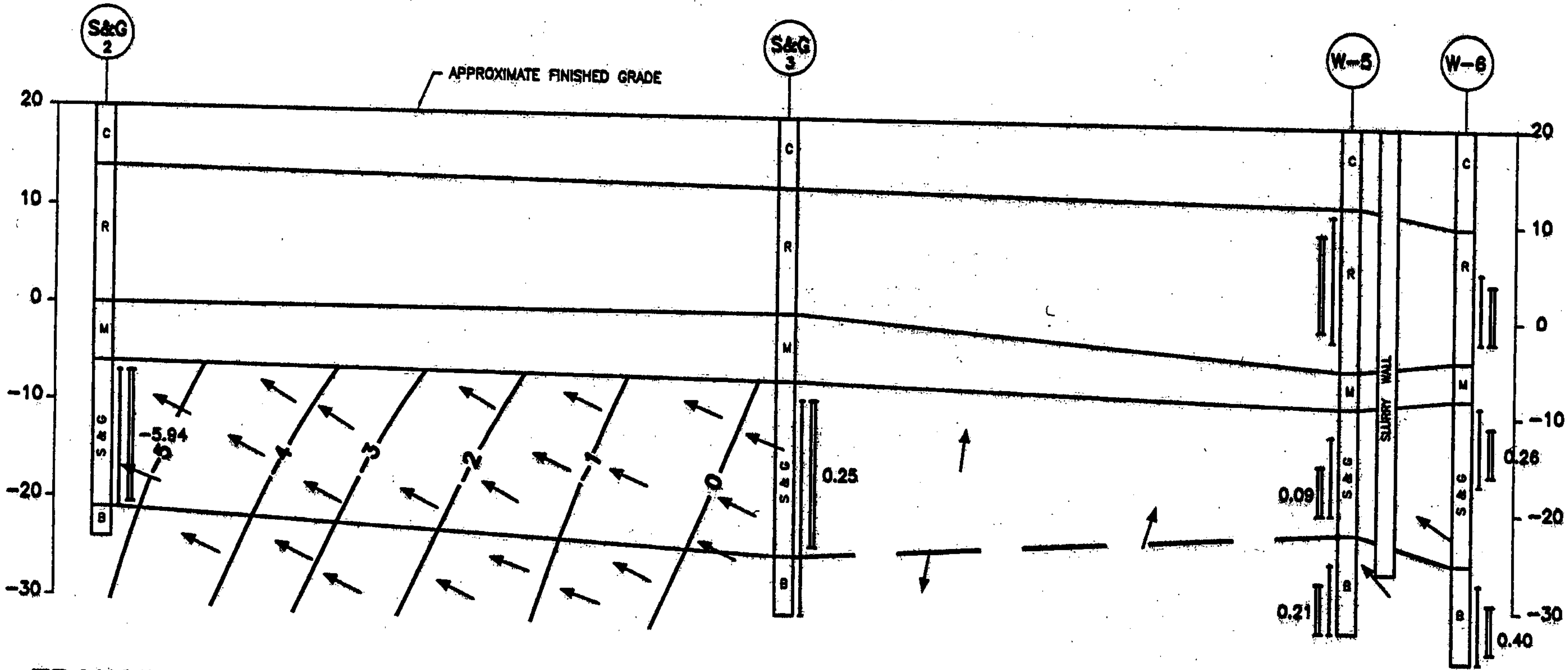

TRANSECT 3

SCALE: N.T.S.

LEGEND:

B - BEDROCK

C - CAP

R - REFUSE

M - MEADOW MAT

S & G - SAND & GRAVEL

0.25 ELEVATION OF WATER LEVEL IN MONITORING WELL, IN FEET MSL, 2/18/03

—2— GROUNDWATER EQUIPOTENTIAL IN BEDROCK AND SAND & GRAVEL, IN FEET MSL, 2/18/03

→ POTENTIAL VERTICAL DIRECTION OF GROUNDWATER FLOW.

SAND PACK INTERVAL

SCREENED INTERVAL

Shaw™

DATE

DWN

APP

REV

PROJECT NO. 791186

KIN-BUC LANDFILL
EDISON TOWNSHIP, EDISON, NEW JERSEY
MIDDLESEX COUNTY, NEW JERSEY

FIGURE 3
TRANSECT 3
HYDROGEOLOGIC CROSS SECTION ANALYSIS

IMAGE Files: <No Images>

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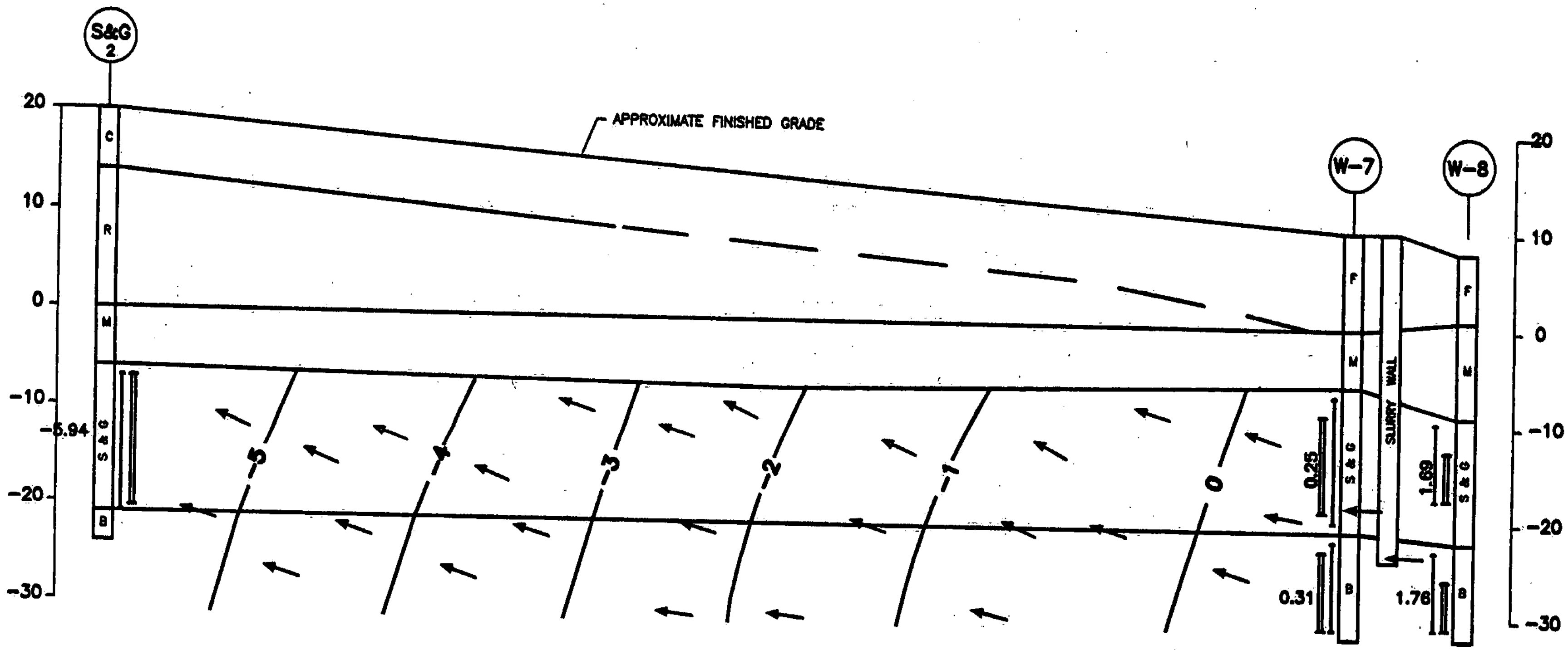

TRANSECT 4

SCALE: N.T.S.

LEGEND:

B - BEDROCK

C - CAP

R - REFUSE

M - MEADOW MAT

S & G - SAND & GRAVEL

0.25 ELEVATION OF WATER LEVEL IN MONITORING WELL, IN FEET MSL, 2/18/03

—2— GROUNDWATER EQUIPOTENTIAL IN BEDROCK AND SAND & GRAVEL, IN FEET MSL, 2/18/03

← POTENTIAL VERTICAL DIRECTION OF GROUNDWATER FLOW.

SAND PACK INTERVAL

SCREENED INTERVAL

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APP ______

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PROJECT NO. 791186

KIN-BUC LANDFILL
EDISON TOWNSHIP, EDISON, NEW JERSEY
MIDDLESEX COUNTY, NEW JERSEY

FIGURE 4

TRANSECT 4

HYDROGEOLOGIC CROSS SECTION ANALYSIS

Table 1
KinBuc Landfill Operable Units 1 and 2
Continuous Hydraulic Monitoring Results
Minimum/Maximum/Average Water Elevations

Inside Slurry Wall					Outside Slurry Wall				
Well ID	Monitoring Period	Minimum Recorded Water Elevation (ft)	Maximum Recorded Water Elevation (ft)	Average Water Elevation (ft)	Well ID	Monitoring Period	Minimum Recorded Water Elevation (ft)	Maximum Recorded Water Elevation (ft)	Average Water Elevation (ft)
W-1G	January February	11.20 11.23	11.24 11.28	11.22 11.25	W-2G	January February	11.31 10.49	13.57 11.93	12.31 11.06
W-3G	January February	7.78 7.43	8.53 8.37	8.06 7.89	W-4G	January February	11.16 10.98	12.23 12.02	11.57 11.41
W-3S	January February	-0.56 -3.25	1.77 1.52	0.46 -0.03	W-4S	January February	-1.23 -1.40	3.08 2.22	0.52 0.27
W-5G	January February	9.55 9.29	10.33 10.17	9.83 9.72	W-6G	January February	13.10 12.85	14.27 14.44	13.54 13.52
W-5S	January February	0.35 -0.16	2.76 2.13	1.27 0.97	W-6S	January February	0.46 -0.04	2.90 2.26	1.37 1.08
W-7S	January February	0.76 0.20	2.81 2.19	1.53 1.21	W-8S	January February	1.71 1.39	5.70 4.21	2.37 2.15
W-15S	January February	2.00 0.64	4.02 3.11	2.94 2.03	W-13S	January February	1.28 0.93	4.08 2.98	2.00 1.78
W-15G	January February	1.34 1.29	1.63 1.61	1.46 1.45	W-13G	January February	3.04 3.36	4.24 4.30	3.77 3.72
W-9G	January February	6.87 6.74	7.71 7.14	7.29 6.92	W-10G	January February	8.03 7.79	8.33 8.05	8.20 7.92
W-3RR	January February	-0.95 -1.56	2.24 1.93	0.28 -0.06	W-4R	January February	-1.46 -1.69	3.02 2.18	0.41 0.13

Table 1
KinBuc Landfill Operable Units 1 and 2
Continuous Hydraulic Monitoring Results
Minimum/Maximum/Average Water Elevations

Inside Slurry Wall					Outside Slurry Wall				
Well ID	Monitoring Period	Minimum Recorded Water Elevation (ft)	Maximum Recorded Water Elevation (ft)	Average Water Elevation (ft)	Well ID	Monitoring Period	Minimum Recorded Water Elevation (ft)	Maximum Recorded Water Elevation (ft)	Average Water Elevation (ft)
W-6R	January February	NA (1) -0.04 (3)	NA (1) 2.29 (3)	0.74 (2) 1.08 (3)	W-6R	January February	0.66 0.11	3.04 2.40	1.53 1.23
W-7R	January February	0.83 -1.28	2.86 2.24	1.60 1.27	W-8RR	January February	1.67 1.38	5.64 4.17	2.34 2.13

Notes:
(1) Troll malfunctioned, data was not collected.
(2) Water elevation calculated from manual water levels.
(3) Water elevation data is from 2/14 - 2/28.

Table 2
KinBuc Landfill Operable Unit 1
February 2003
Troll Water Elevations vs. Manual Water Elevations

OU 1 Well ID	March 3 - 4, 2003		
	Troll	Manual	Difference
W-1G	11.27	11.26	0.01
W-2G	11.86	11.85	0.01
W-3G	7.82	7.82	0.00
W-3S	0.36	0.40	0.04
W-3RR	0.17	0.15	0.02
W-4G	11.69	11.36	0.33
W-4S	0.69	0.69	0.00
W-4R	0.41	0.51	0.10
W-5G	9.59	9.65	0.06
W-5S	1.14	1.18	0.04
W-5R	1.06	1.07	0.01
W-6G	13.70	13.70	0.00
W-6S	1.34	1.35	0.01
W-6R	1.44	1.45	0.01
W-7S	1.51	1.53	0.02
W-7R	1.59	1.59	0.00
W-8S	2.07	2.04	0.03
W-8RR	2.12	2.07	0.05
W-9G	6.99	6.96	0.03
W-10G	7.90	7.91	0.01
W-13G	6.60	6.69	0.09
W-13S	2.14	2.15	0.01
W-15G	1.42	1.42	0.00
W-15S	1.91	1.95	0.04

Table 3
Kin-Buc Landfill
Leachate Cleanout Monitoring
2003

Cleanout location	14N		14E		15N		15E		16N		16E	
Elevation @ Sea Level	22.87		22.77		26.51		26.51		31.36		31.32	
	depth to water	elevation	depth to water	elevation	depth to water	elevation	depth to water	elevation	depth to water	elevation	depth to water	elevation
Elevation Average		10.09		10.06		9.85		9.93		na		na
DATE												
12/10/2001	12.5	10.37	12.42	10.35	16.31	10.20	16.33	10.18	dry	na	dry	na
1/3/2002	12.37	10.50	12.31	10.46	16.21	10.30	16.22	10.29	dry	na	dry	na
2/13/2002	12.70	10.17	12.63	10.14	16.57	9.94	16.62	9.89	dry	na	dry	na
3/27/2002	12.61	10.26	12.55	10.22	16.52	9.99	16.47	10.04	dry	na	dry	na
4/19/2002	12.75	10.12	12.68	10.09	16.64	9.87	16.61	9.90	dry	na	dry	na
5/3/2002	13.03	9.84	12.96	9.81	16.97	9.54	16.94	9.57	dry	na	dry	na
6/5/2002	13.04	9.83	12.97	9.80	16.63	9.88	16.95	9.56	dry	na	dry	na
7/8/2002	12.86	10.01	12.79	9.98	16.77	9.74	16.72	9.79	dry	na	dry	na
8/2/2002	12.86	10.01	12.79	9.98	16.8	9.71	15.73	10.78	dry	na	dry	na
9/5/2002	12.86	10.01	12.78	9.99	16.77	9.74	16.75	9.76	dry	na	dry	na
9/26/2002	12.94	9.93	12.85	9.92	16.85	9.66	16.83	9.68	dry	na	dry	na
11/6/2002	12.64	10.23	12.58	10.19	16.59	9.92	16.48	10.03	dry	na	dry	na
12/6/2002	13.02	9.85	12.94	9.83	16.97	9.54	16.95	9.56	dry	na	dry	na
1/2/2003	13.07	9.80	13.00	9.77	17.03	9.48	17.01	9.50	dry	na	dry	na
2/12/2003	13.20	9.67	13.12	9.65	17.19	9.32	17.16	9.35	dry	na	dry	na
3/4/2003	13.21	9.66	13.15	9.62	17.22	9.29	17.20	9.31	dry	na	dry	na

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ATTACHMENT 1

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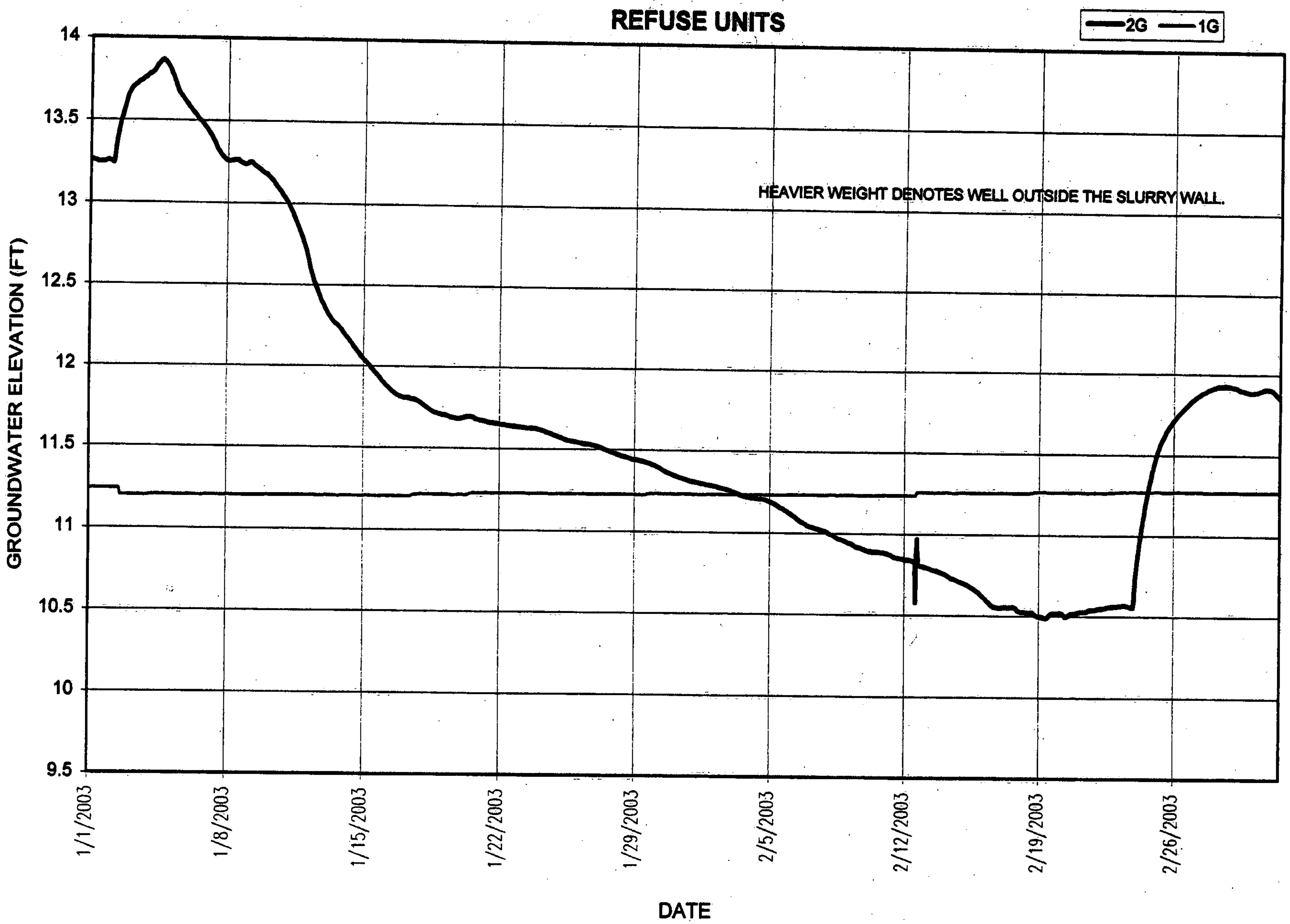

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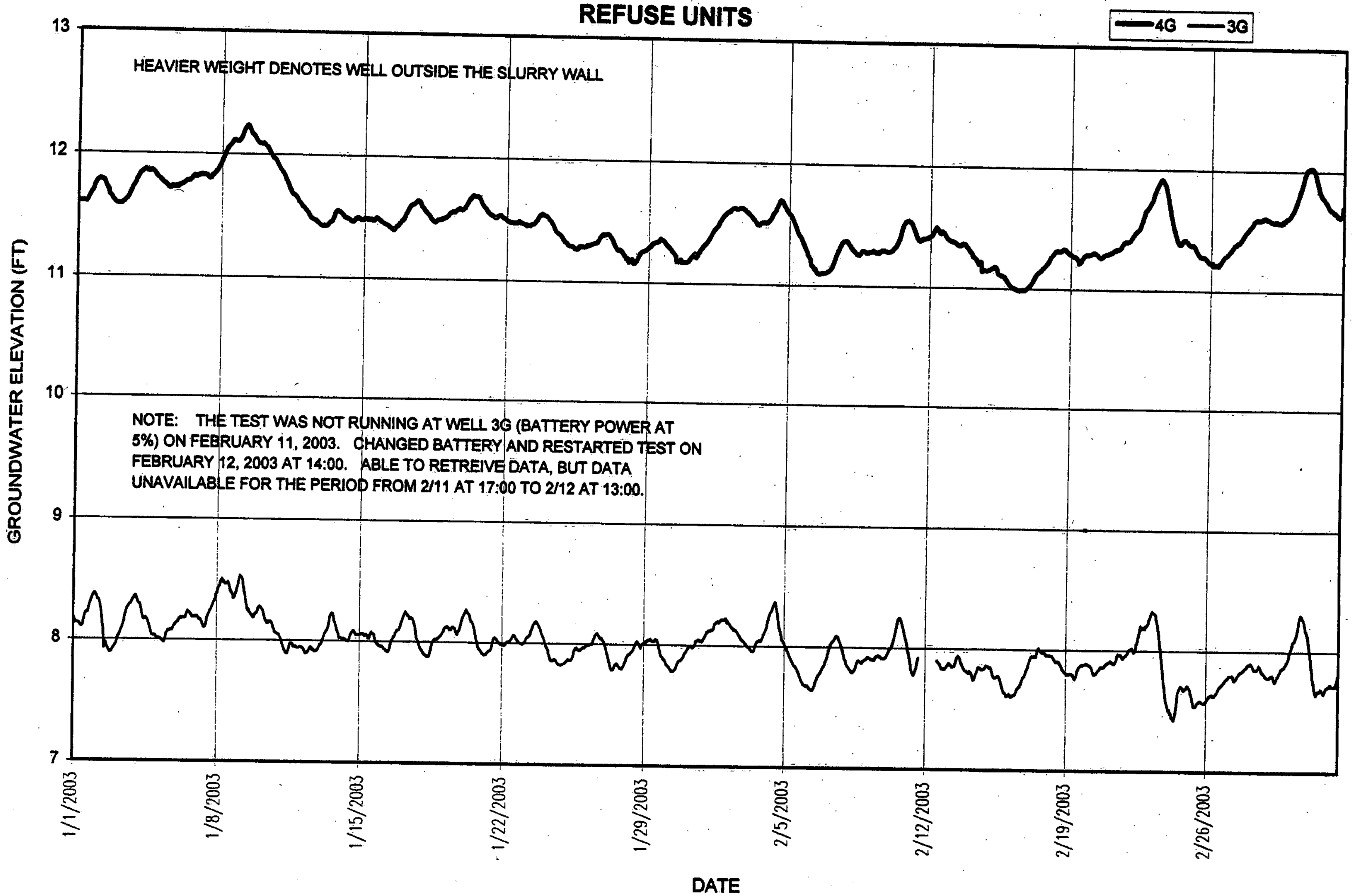

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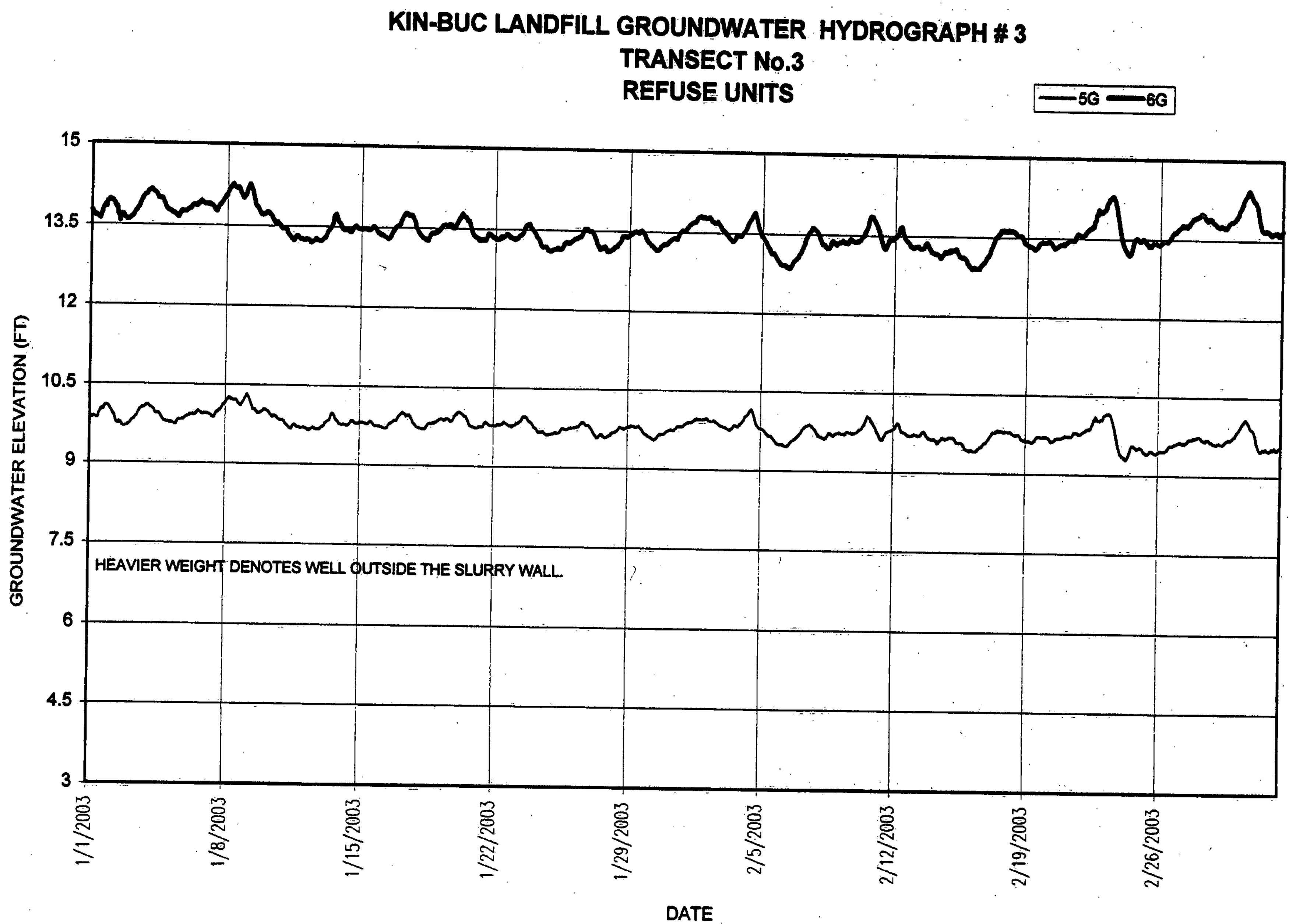

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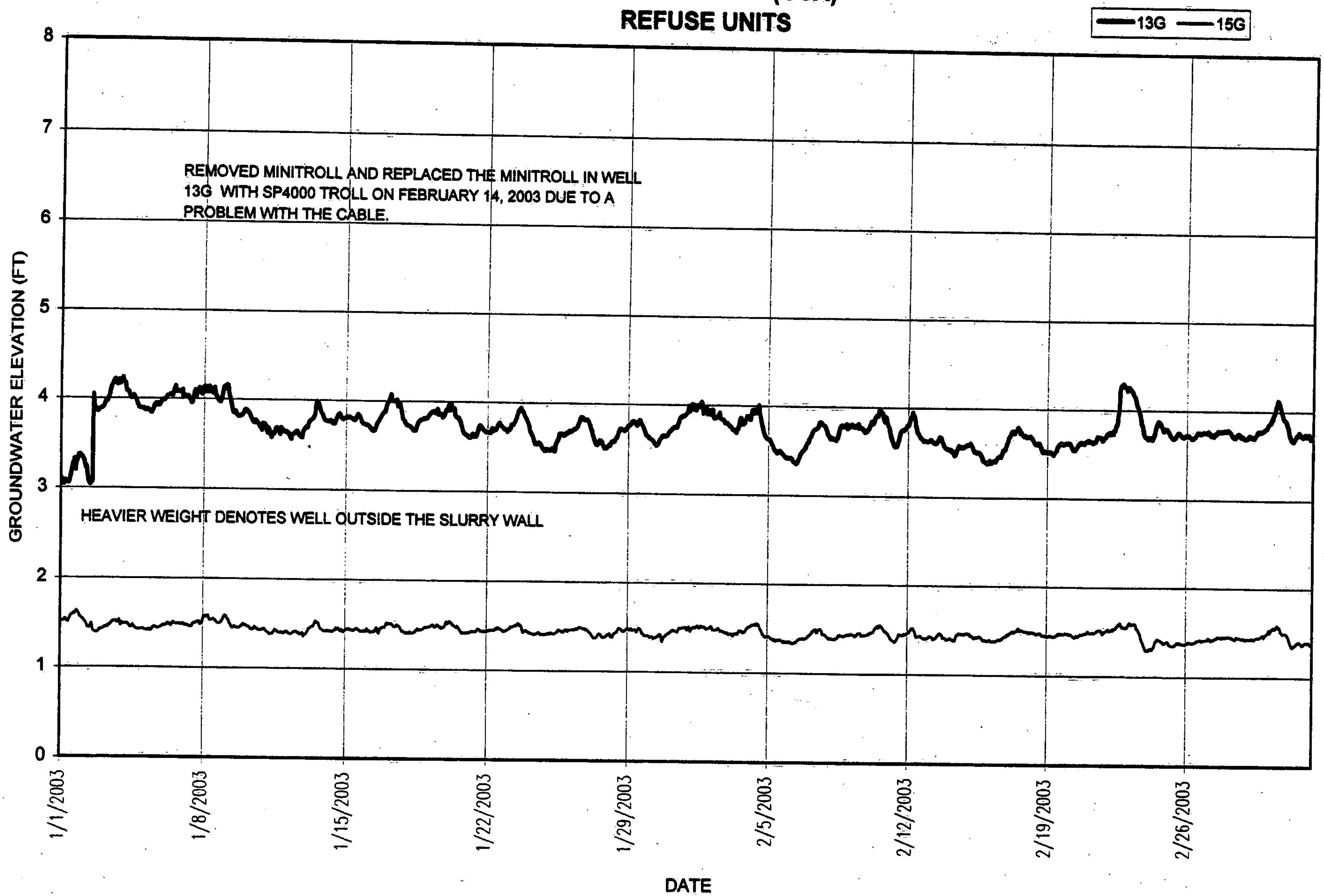

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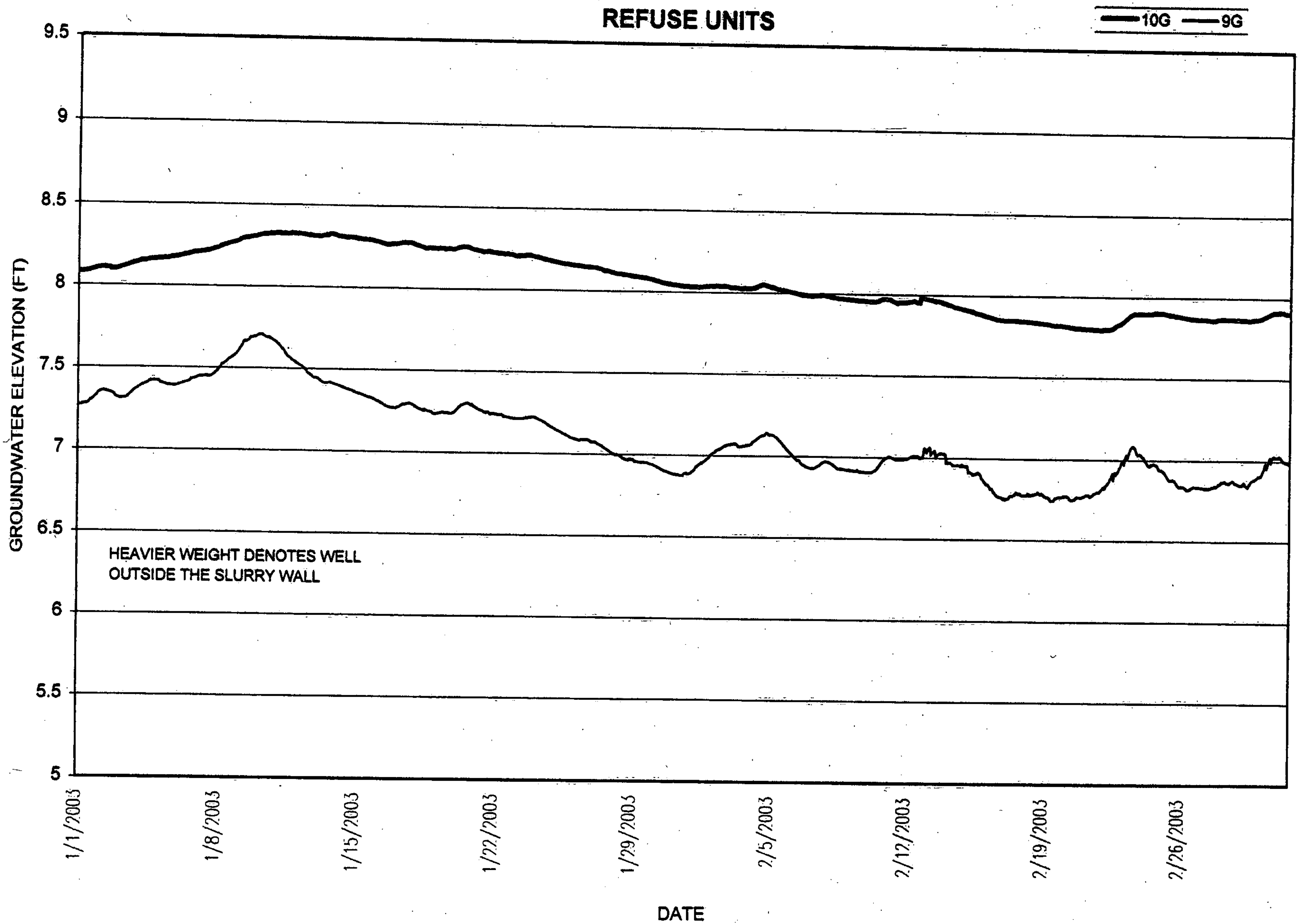

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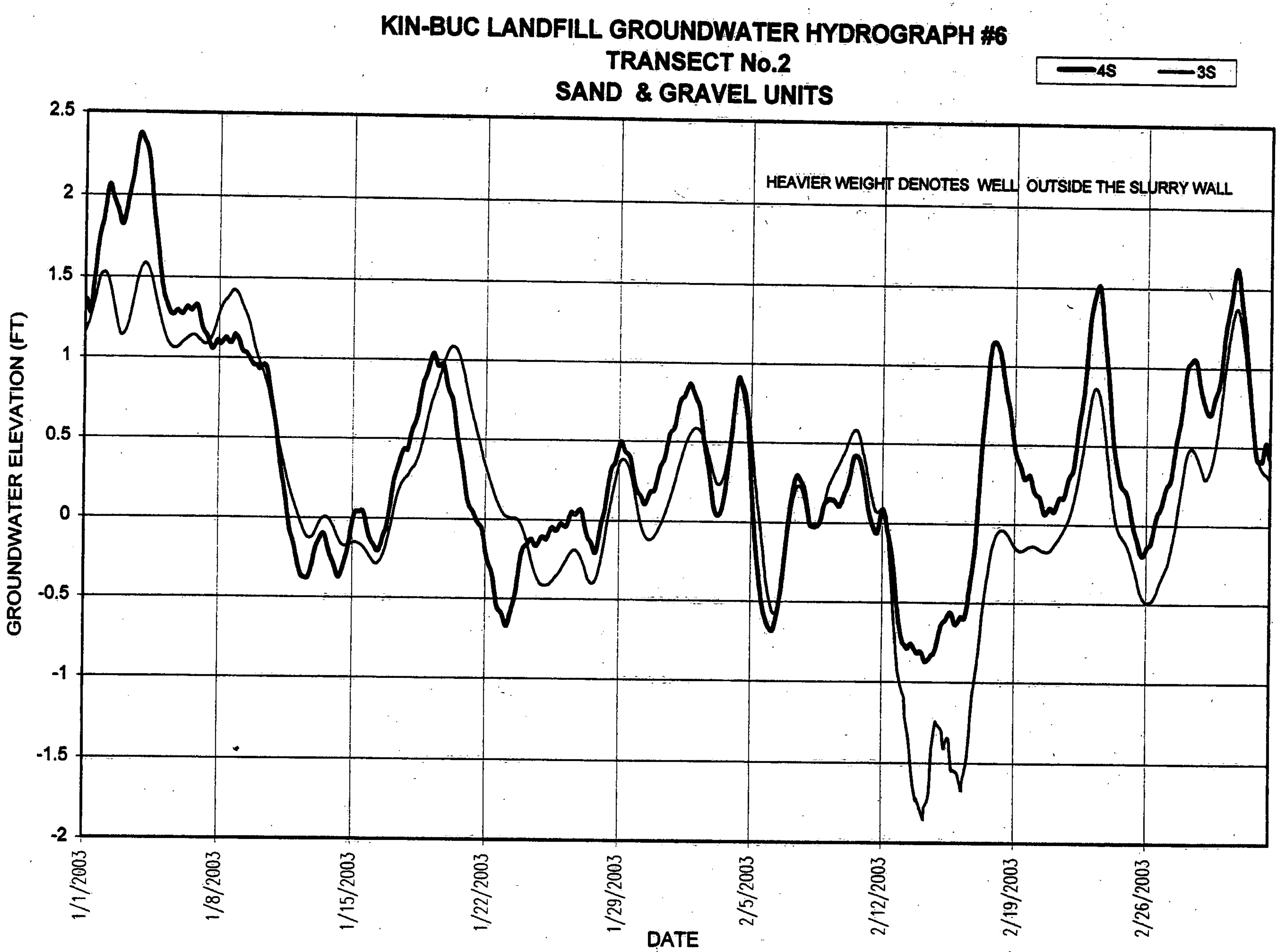

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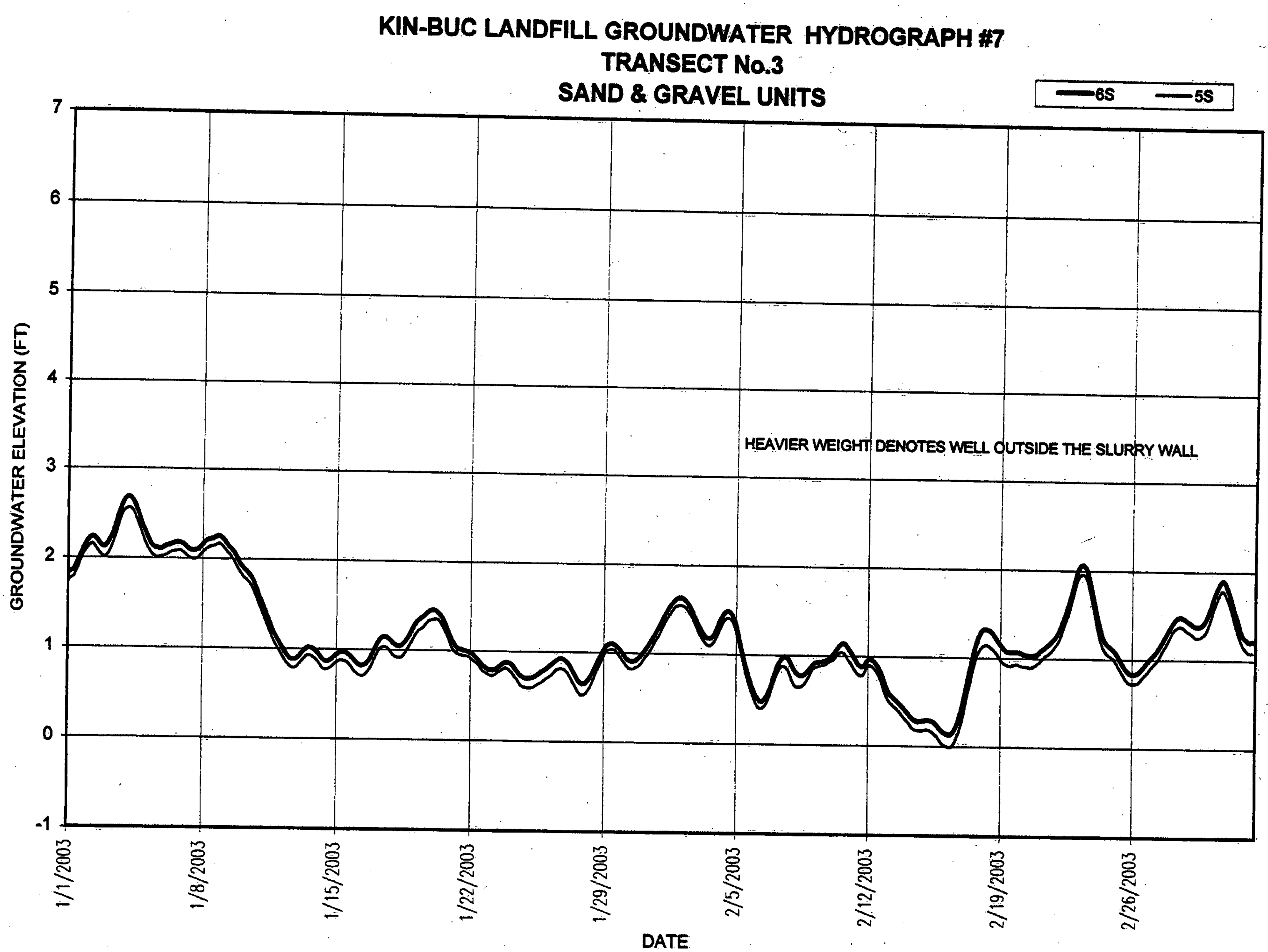

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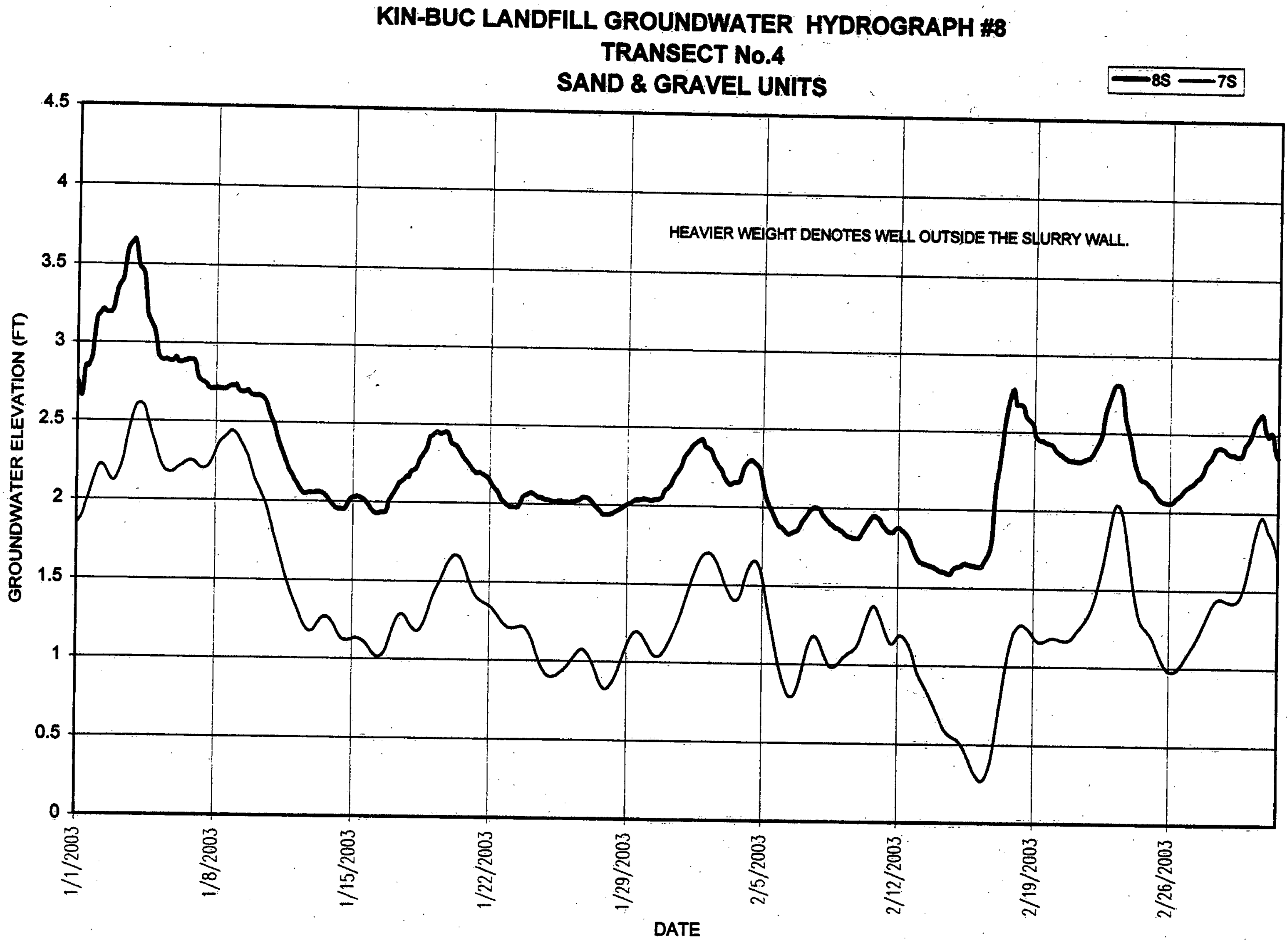

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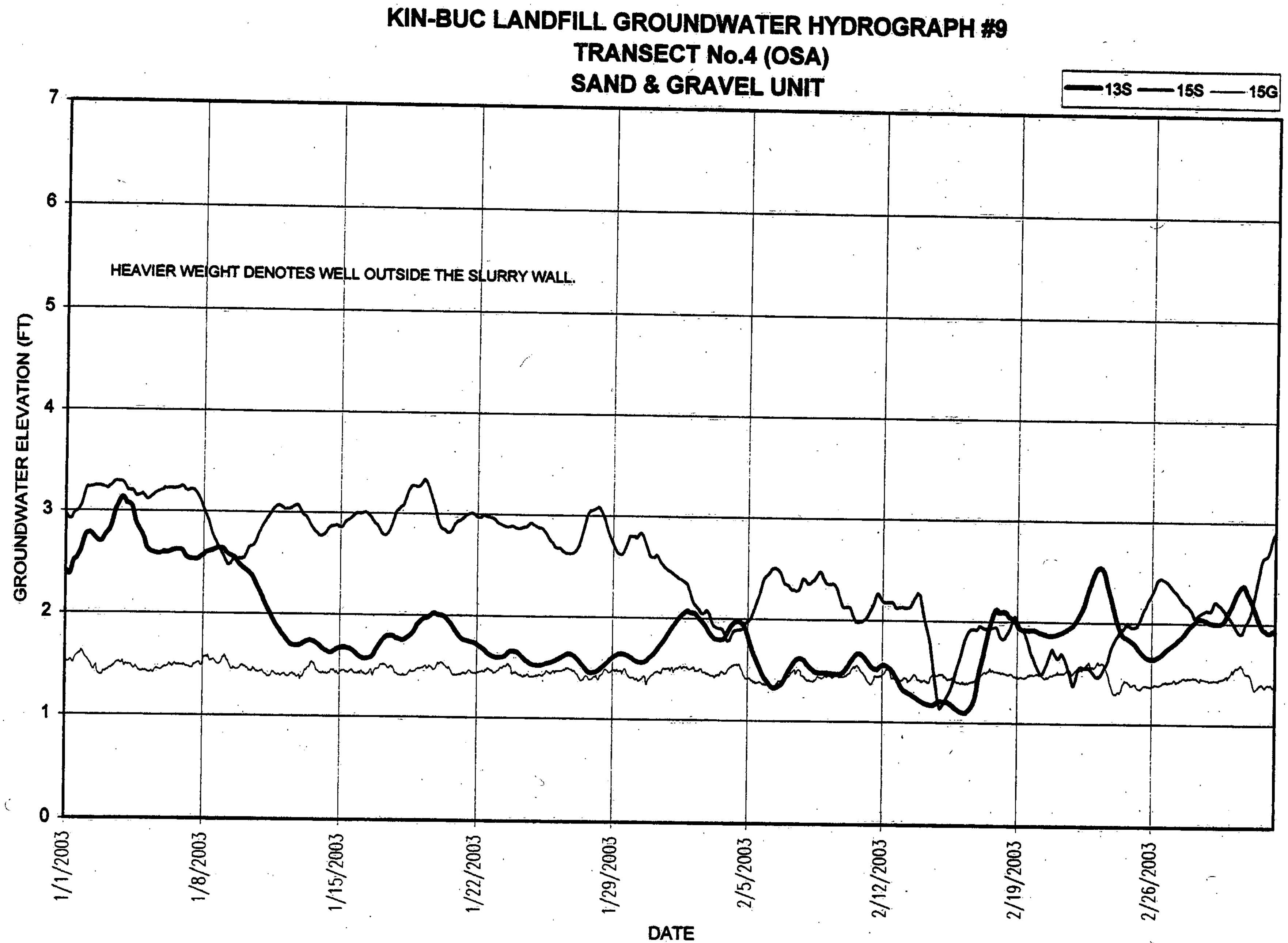

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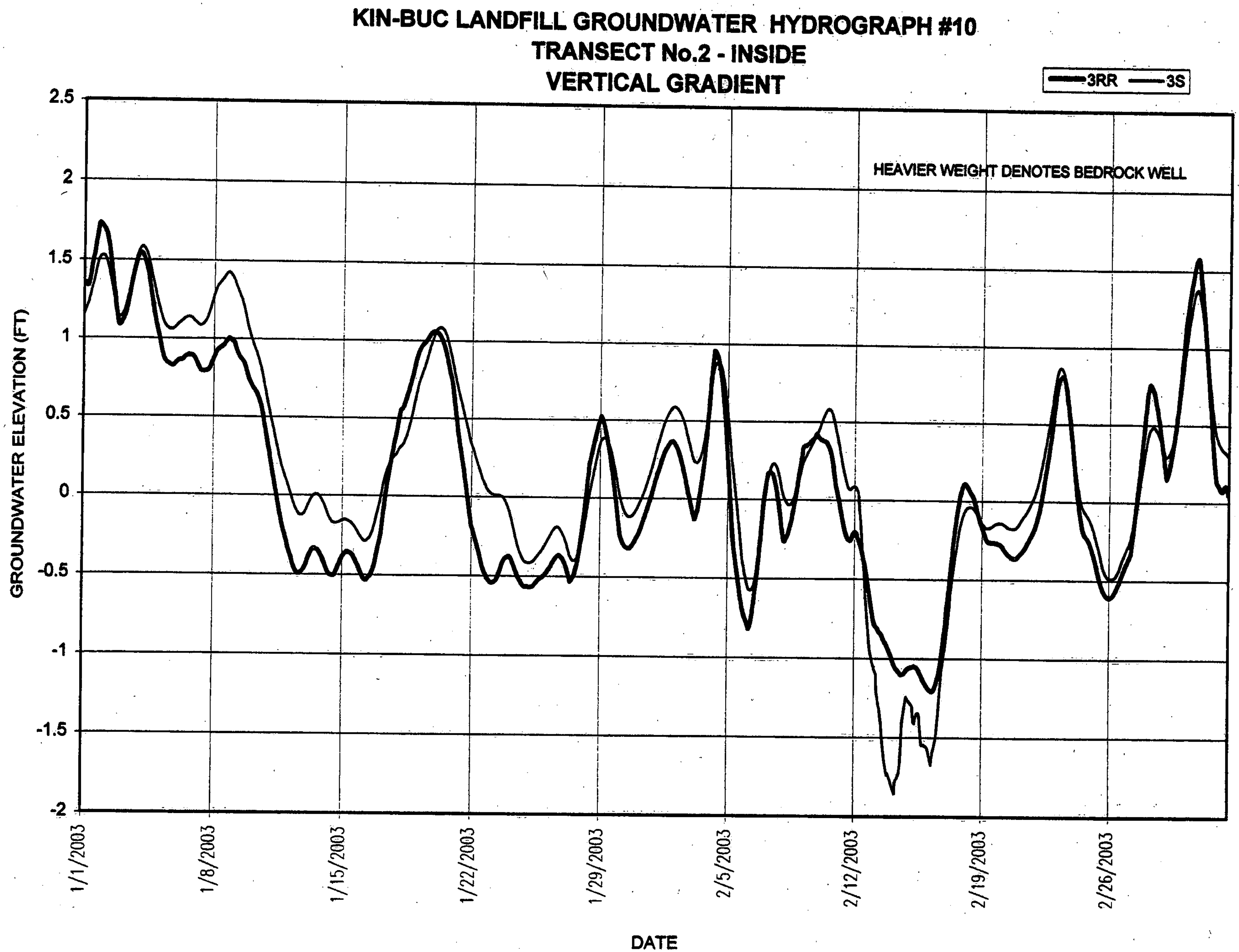

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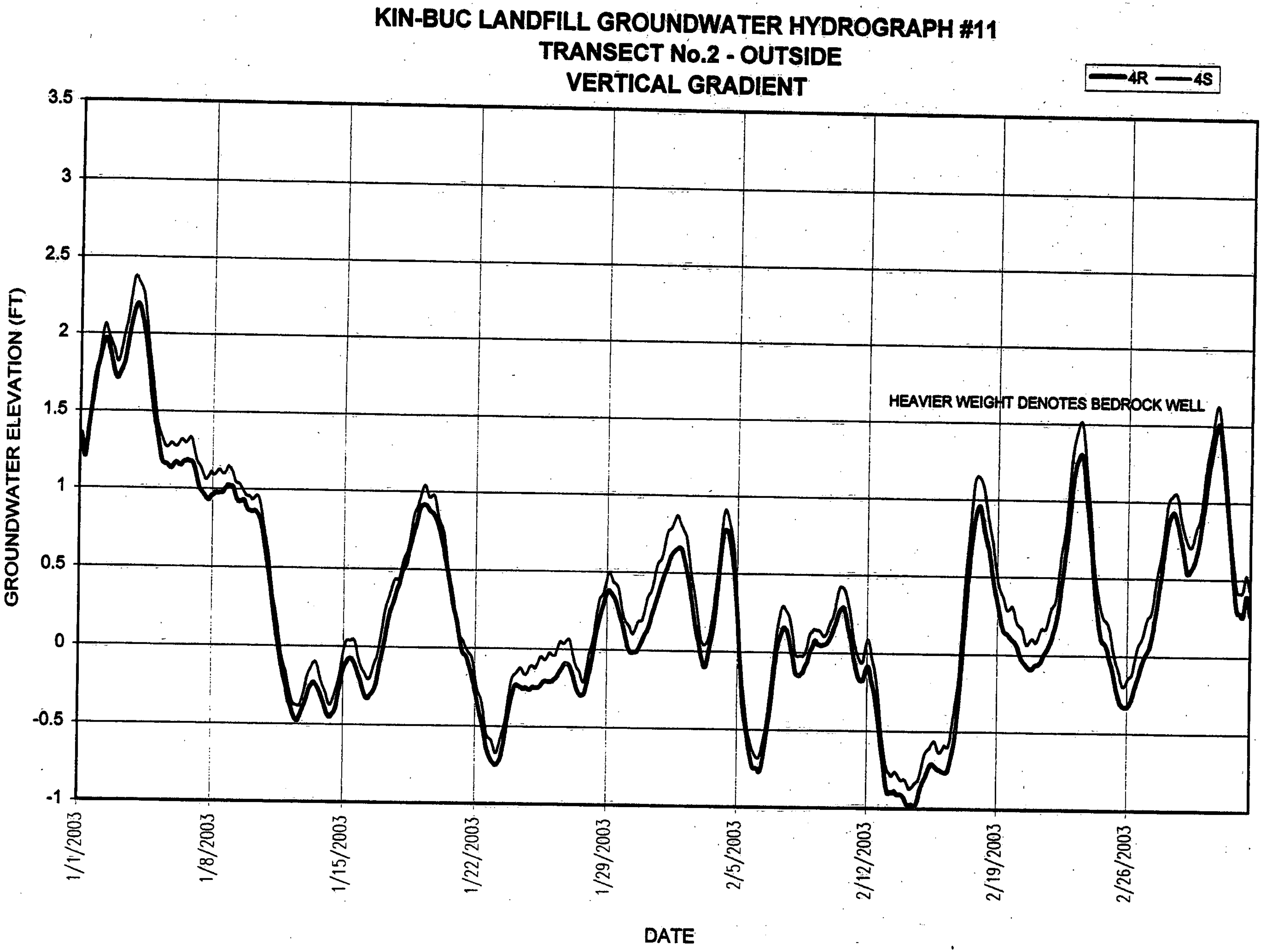

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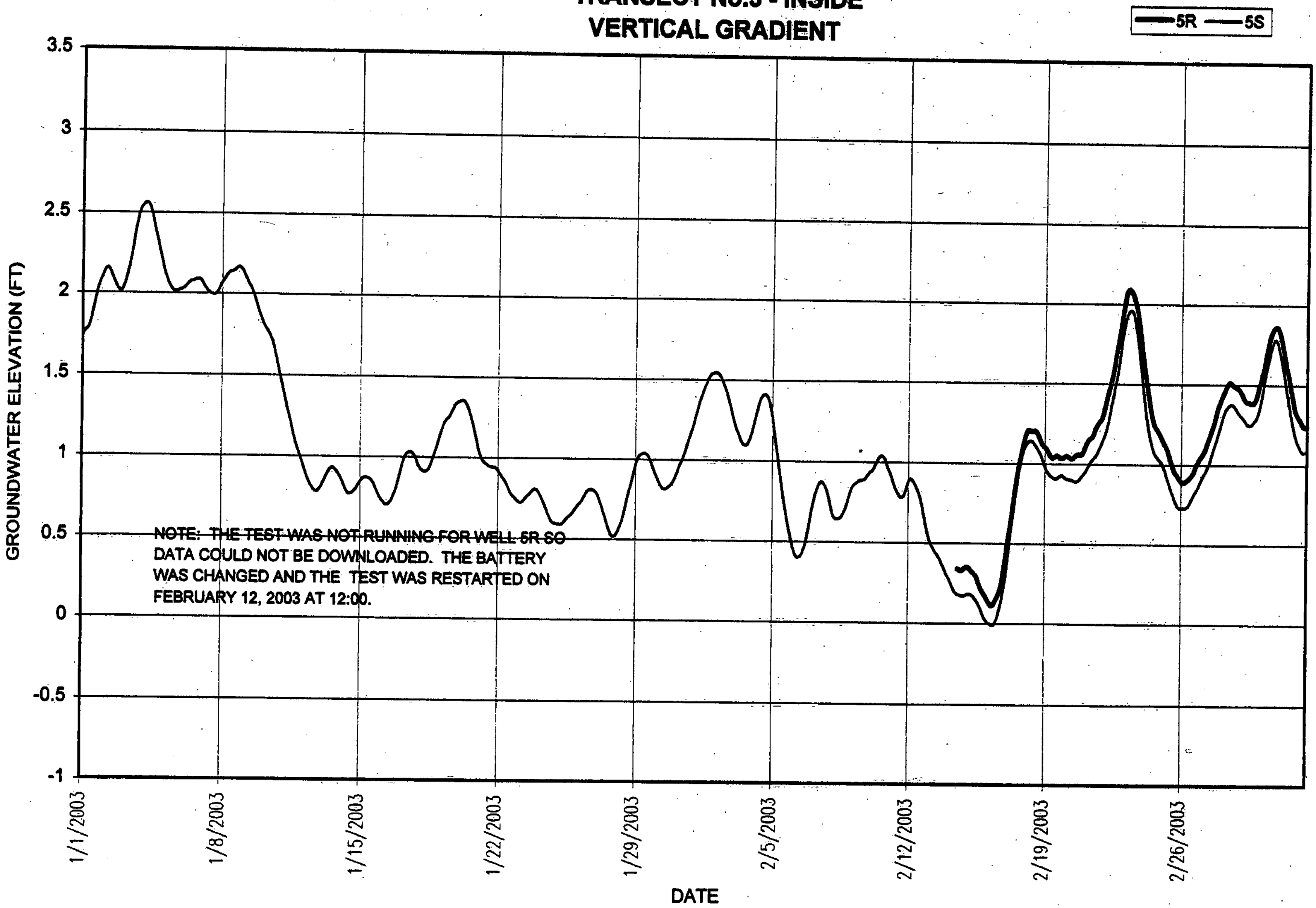
VERTICAL GRADIENT



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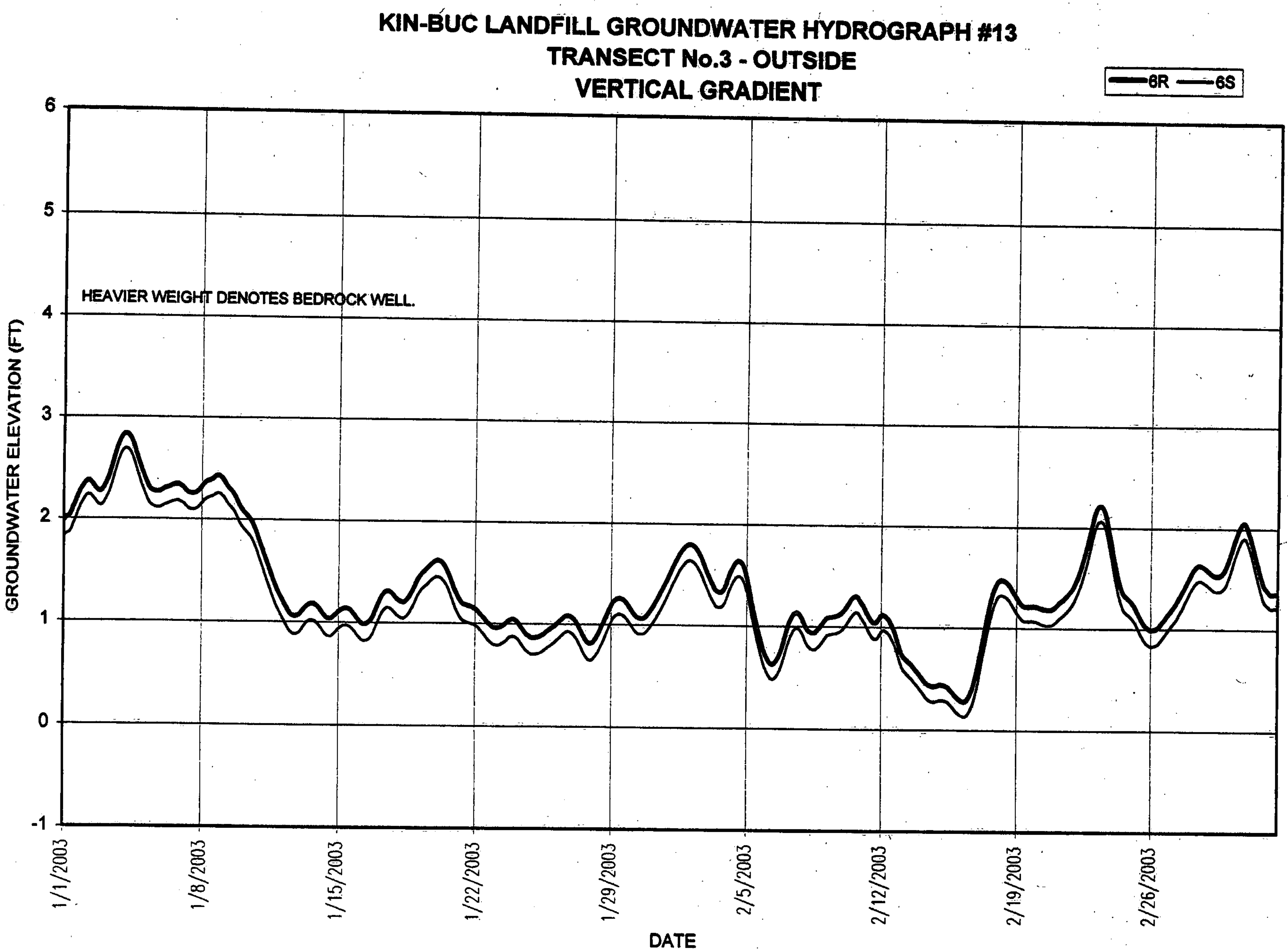

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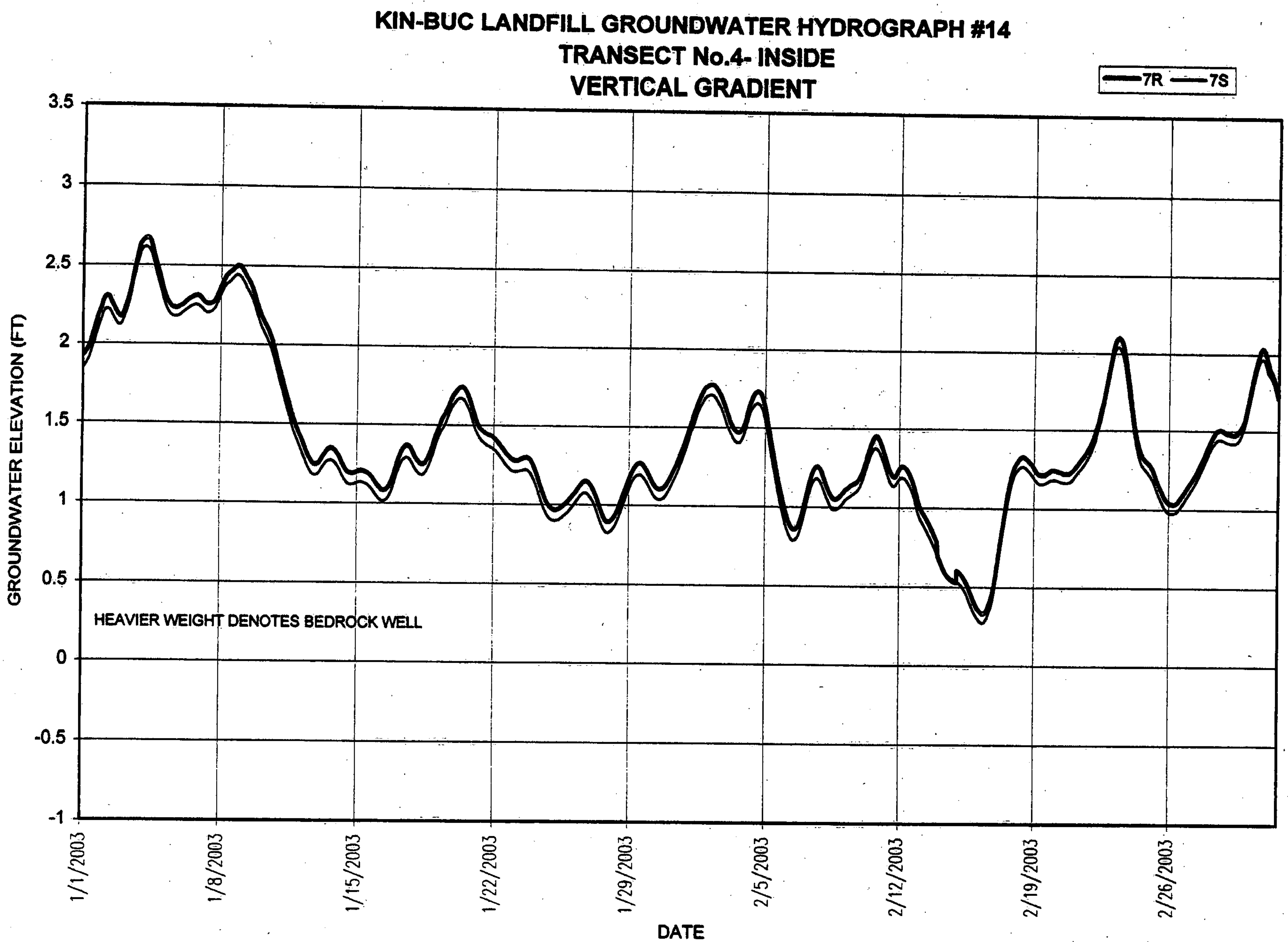

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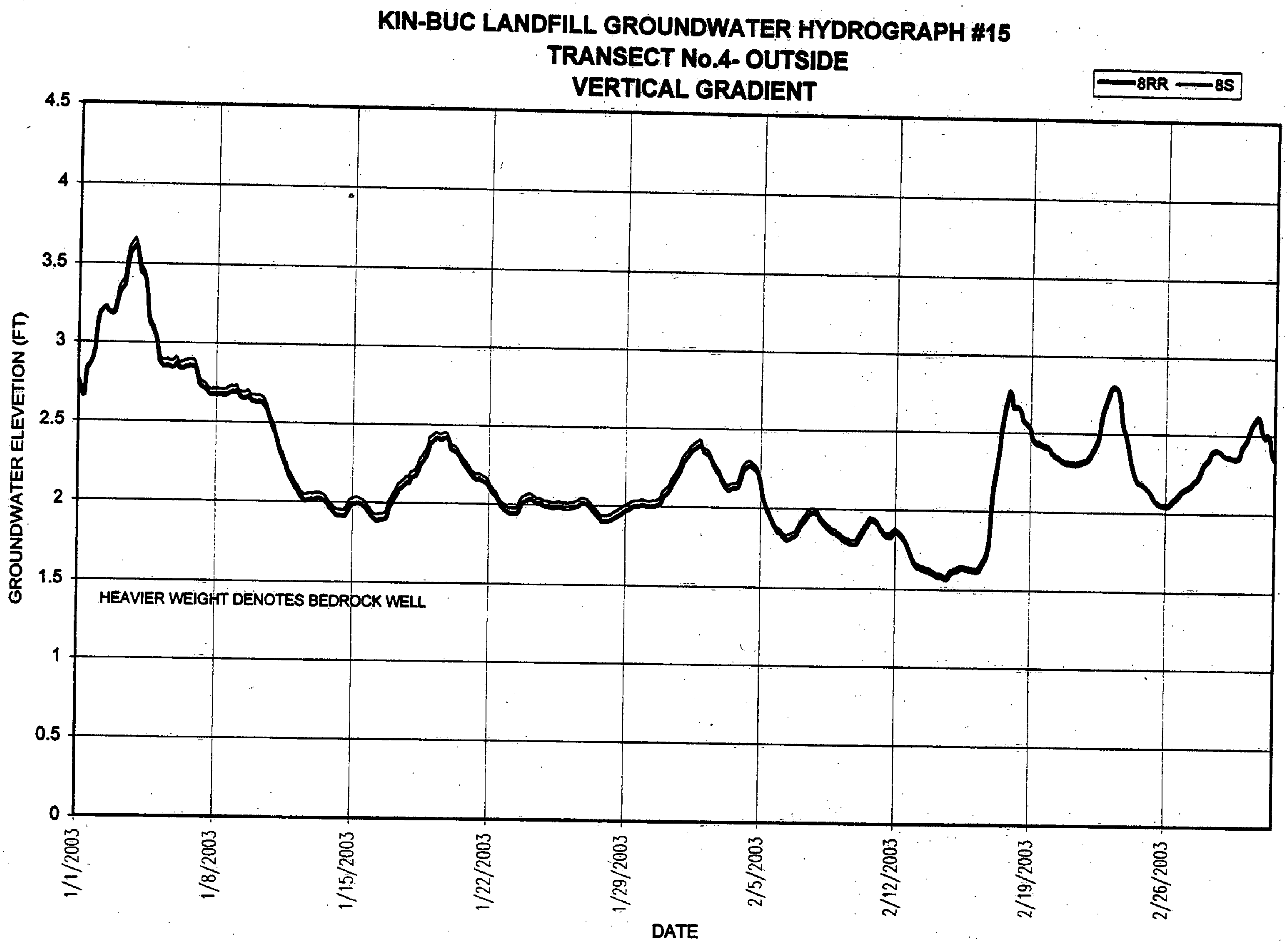

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ATTACHMENT 2

IT Corporation
Crossroads Corporate Center
One International Boulevard, Suite 700
Mahwah, NJ 07495-0086
Tel. 201.512.5700
Fax. 201.512.5786
A Member of The IT Group

June 27, 2001
Project 796201

Carl Januszkiewicz
Waste Management, Inc
Kin-Buc Landfill Treatment Plant
383 Meadow Road
Edison, NJ 08817

Re: Evaluation of Head Levels at Transect 1

Dear Mr. Januszkiewicz:

We have completed an evaluation of the hydraulic characteristics at Transect 1 with specific focus on the lack of intragradient conditions associated with the high water levels in W-1G (inside of the slurry wall) relative to those levels in W-2G (outside of the wall).

While intragradient conditions were evident at the outset of the hydraulic monitoring program in April 1996, these conditions have generally not been maintained. Specifically, based on a review of historical hydrographs, intragradient conditions were evident initially from approximately April to July 1996, and April to June 1997. Thereafter, to more recent events, intragradient conditions have been observed intermittently and for shorter periods of time.

Attachment 1 presents a hydrograph at Transect 1 encompassing the period from September 1998 to December 2000. As seen on the hydrograph, there were periods of time when intragradient conditions were not being maintained.

As opposed to the other "G" series monitoring wells that are located in refuse, wells 1G and 2G at Transect 1 are actually located in a silt and clay deposit. Attachment 2 contains the boring logs for these 2 installations. In-situ hydraulic conductivity testing performed at Transect 1 indicated permeabilities of 10^{-7} cm/sec and 10^{-5} cm/sec in W-1G and W-2G, respectively. Accordingly, a source of recharge to the overburden soils in the area of W-1G would not readily drain away, and therefore, higher heads could result.

Well 1G sampling events (November 1998, October 1999, October 2000) can be seen on the hydrograph as sharp vertical drops in groundwater levels. Due to the low permeability of the surrounding materials, the groundwater levels required several months to recover. Since the final cover extends 10 feet past the slurry wall, the source of the groundwater that is recharging W-1G is unknown at present.

The hydraulic gradient between W-1G and W-1R is vertically downward which rules out the bedrock as being a source of groundwater recharge. Based on a recent visual inspection of the area around Transect 1, the cap appears to be good condition and there were no signs that the cap integrity has been compromised.

Figure 1 depicts the conceptual model of the hydraulic interrelationship across Transect 1 showing water level measurements that depict the lack of intragradient conditions across the

slurry wall. The head levels in W-2G (outside the slurry wall) are generally at elevation 12 to 13 feet msl with periodic and short term increases to about 15 feet msl. The water level in the well sometimes falls below the level of the transducer. This is characterized by a flat straight line on the hydrographs as shown on Attachment 1. Head levels in W-1G (inside the slurry wall), on the other hand, are often greater with elevations as high as 15 to 16 feet msl being recorded.

It is evident from a review of Figure 1 that the drop in topography outside of the slurry wall toward Mill Brook, coupled with the higher permeability of W-2G relative to W-1G, would promote a more rapid decrease of head levels in the latter. This suggests that intragradient conditions may not be consistently attainable at this transect in any event. This notwithstanding however, and as depicted on Figure 1, it is important to note that the leachate collection system represents a hydraulic sink within the containment system. As such, groundwater in the vicinity of W-1G would drain toward the sink mitigating concerns of outward flow.

The leachate collection line runs parallel to the slurry wall and at its closest point is only about 20 feet away from Transect 1. Several cleanouts are located along the collection line with the closest, Cleanout 16, only about 65 feet from Transect 1. Leachate level measurements obtained from the cleanouts during December 2000 and June 2001 indicate a leachate level of 10 to 11 feet msl along the collection line as shown in Table 1. The leachate levels observed suggest that the leachate collection system is presently operating effectively.

Recommendations

Based on the above, it is recommended that during subsequent monitoring events at the site, measurements of leachate levels in Cleanouts 14 through 16 be recorded to verify that the leachate collection system is operating effectively. If liquid levels in the cleanouts increase above 12 to 13 feet msl, then maintenance of the collection line is recommended. Subsequent reports to EPA should include a discussion of the leachate collection system and its role as serving as a hydraulic sink within the containment system.

We trust you find this information useful. If you have any questions, please do not hesitate to contact us.

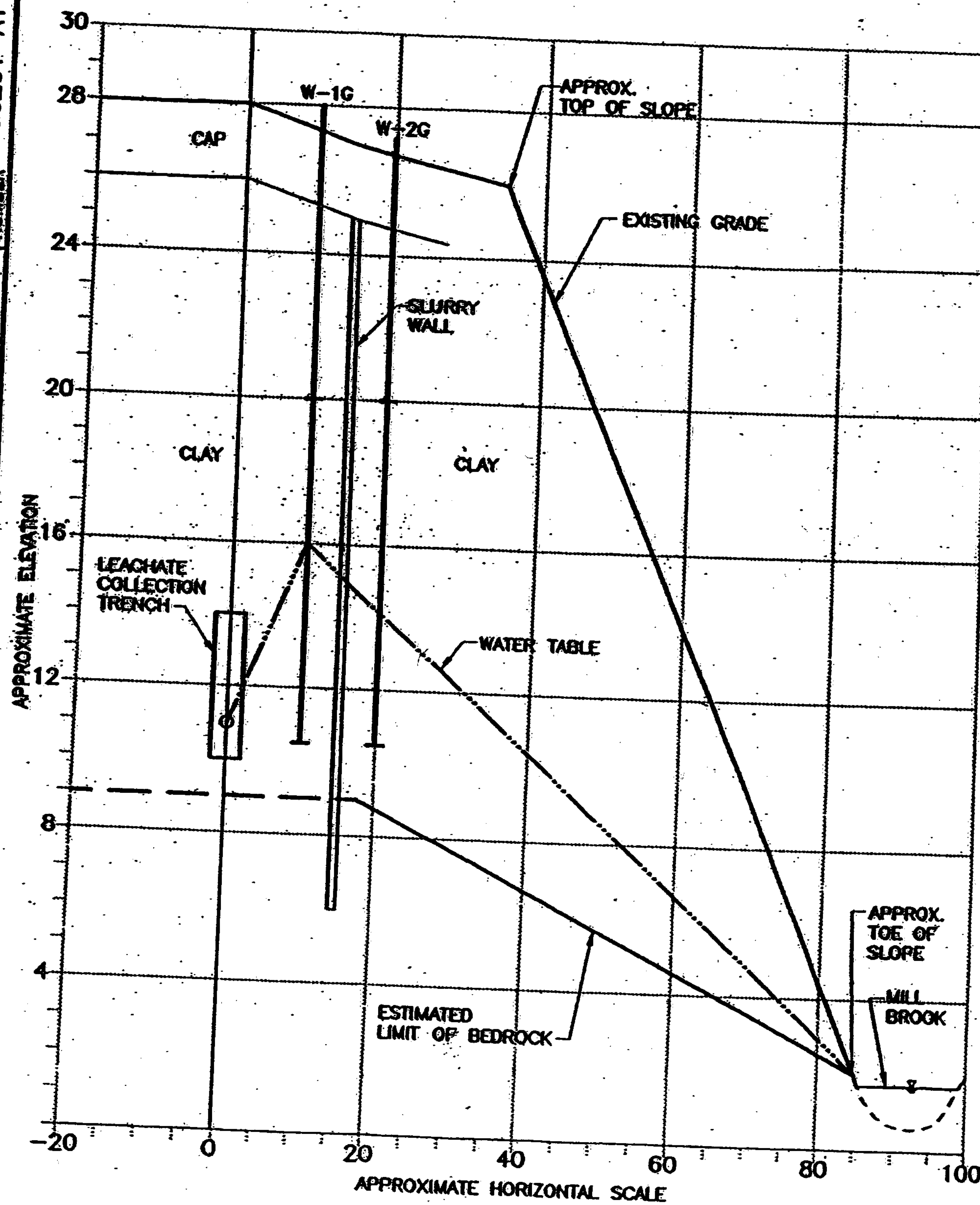
Sincerely,

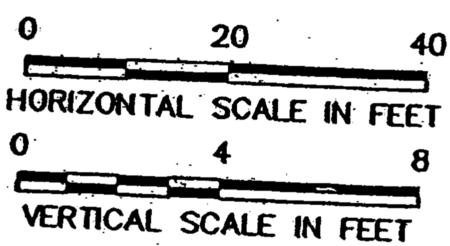
IT Corporation

Steven Goldberg, Ph.D, CPG
Senior Hydrogeologist

Thomas M. Connors, P.E.
Project Manager

Attachments





WASTE MANAGEMENT INC.

IT CORPORATION

FIGURE 1

CROSS SECTION TRANSECT 1

KIN-BUC LANDFILL
EDISON, NEW JERSEY

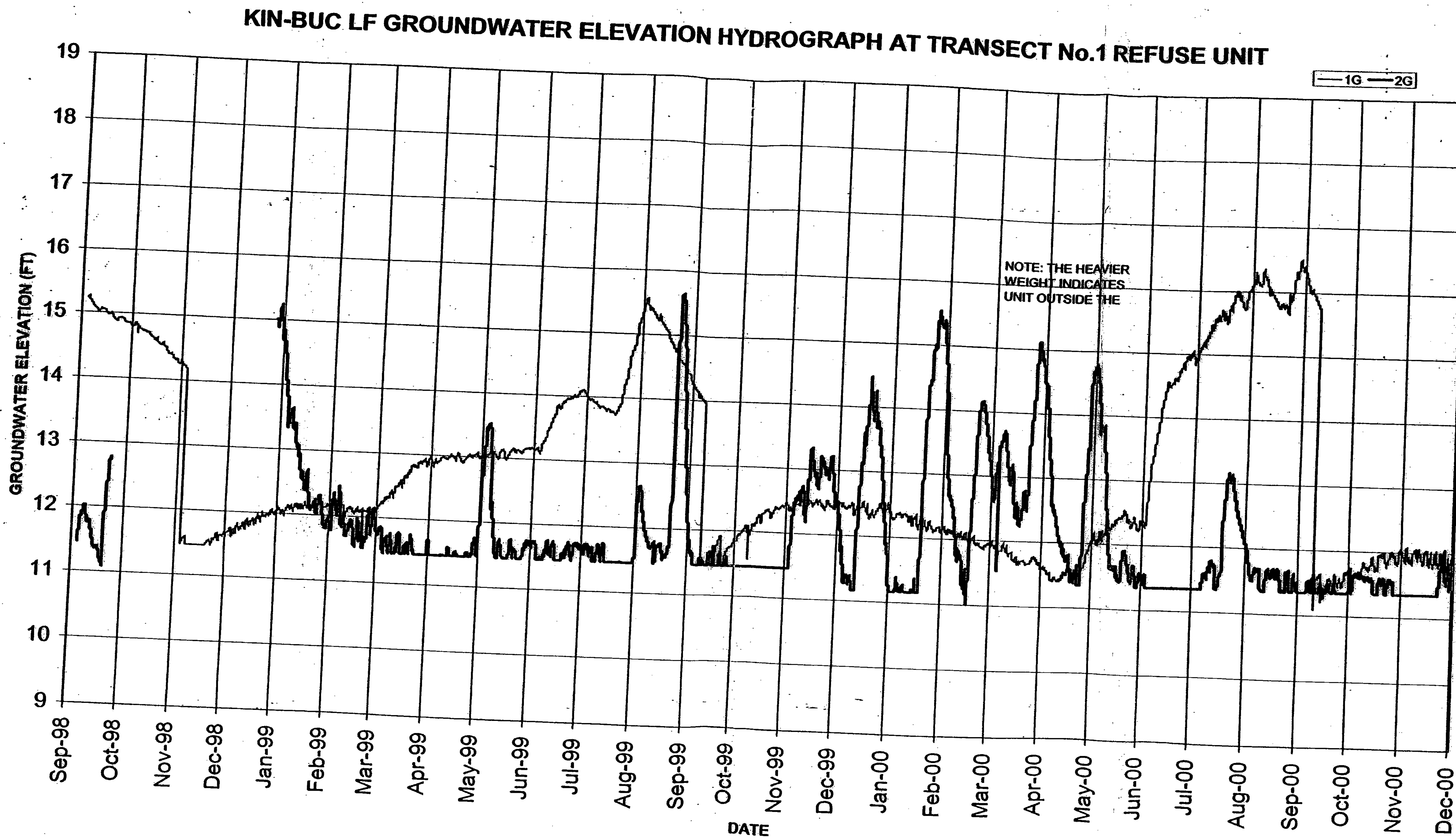
IMAGE	X-REF	OFFICE	DRAWN BY	CHECKED BY	APPROVED BY	DRAWING NUMBER
---	---	Mahwah, NJ	A. [illegible] 2/2001	—	—	796201-A1

[redacted] FIGUR[redacted] Tue, 2/7/Feb/01 [redacted] 10:29am dkinsella
Softdesk Project: N:\SDSK\PROJ\<none> Dimscale: 1 Ltscale: 1 Pltscale: 1

Table 1
Kin-Buc Landfill
Leachate Cleanout Monitoring
2001

Cleanout location	14N		14E		15N		15E		16N		16E	
Elevation @ Sea Level	22.87		22.77		26.51		26.51		31.36		31.32	
	depth to water	elevation	depth to water	elevation	depth to water	elevation	depth to water	elevation	depth to water	elevation	depth to water	elevation
Elevation Average		10.80		10.74		10.66		10.67				11.11
DATE												
6/7/01	11.98	10.89	12.02	10.75	15.86	10.65	15.87	10.64	dry	na	dry	na
5/16/01	12.25	10.62	12.23	10.54	15.96	10.55	15.96	10.55	dry	na	dry	na
4/26/01	12.36	10.51	12.35	10.42	15.99	10.52	16.01	10.50	dry	na	dry	na
3/21/01	11.80	11.07	11.75	11.02	15.62	10.89	15.59	10.92	dry	na	dry	na
2/26/01	12.03	10.84	11.94	10.83	15.95	10.56	15.92	10.59	dry	na	dry	na
1/29/01	12.08	10.79	11.98	10.79	15.85	10.66	15.83	10.68	dry	na	20.41	10.91
12/27/01	12.02	10.85	11.94	10.83	15.72	10.79	15.68	10.83	dry	na	20.01	11.31

ATTACHMENT 1



n:common\noel\yearKBGW\4 98 - 4 00

ATTACHMENT 2

MONITORING WELL RECORD

Well Permit No. 25 - 46506
Atlas Sheet Coordinates 25 : 45 : 428

OWNER IDENTIFICATION - Owner KIN-BUC INC
Address 200 CENTENNIAL AVE.
City PISCATAWAY State NJ Zip Code

WELL LOCATION - If not the same as owner please give address. Owner's Well No. 2G
County MIDDLESEX Municipality EDISON TWP
Address 383 Meadows Road, Edison, NJ Lot No. 400 Block No. 3C

TYPE OF WELL (as per Well Permit Categories) MONITORING
Regulatory Program Requiring Well CERCLA Date well completed 2 / 15 / 95
Case I.D. # NJD049860836
CONSULTING FIRM/FIELD SUPERVISOR (if applicable) Tele. #

WELL CONSTRUCTION

Total depth drilled 15.6 ft.
Well finished to 15 ft.
Borehole diameter:
Top 8 in.
Bottom 8 in.
Well was finished: [X] above grade [ ] flush mounted
If finished above grade, casing height (stick up) above land surface 4 ft.

	Depth to Top (ft.) [From land surface]	Depth to Bottom (ft.)	Diameter (inches)	Type and Material
Inner Casing	+4	5	2	Sch 40 PVC
Outer Casing (Not Protective Casing)				
Screen (Note slot size)	5	15	2	Sch 40 PVC .010
Tail Piece				
Gravel Pack	3	15.6	8	#00 Ricci
Annular Seal/Grout	0	3	8	Bentonite slurry
Method of Grouting	tremie			

Was steel protective casing installed? [ ] Yes [X] No
Static water level after drilling - ft.
Water level was measured using -
Well was developed for N/A hours at N/A gpm
Method of development N/A
Was permanent pumping equipment installed? [ ] Yes [X] No
Pump capacity N/A gpm
Pump type: N/A
Drilling Method HSA
Drilling Fluid - Type of Rig B-61
Name of Driller Chad Chism
Health and Safety Plan submitted? [ ] Yes [X] No
Level of Protection used on site (circle one) None D C B A
License No. 0013753-001375
Name of Drilling Company HARDIN-HUBER, INC.

GEOLOGIC LOG (Copies of other geologic logs and/or geophysical logs should be attached.)

0 - 15.6	red dry stiff clay, some silt

I certify that I have drilled the above-referenced well in accordance with all well permit requirements and all applicable State rules and regulations.

Driller's Signature Chad Chism Date 2/15/95

COPIES: White - DEP Canary - Driller Pink - Owner Goldenrod - Health Dept.

DWR-138 M
11/94

NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF WATER ALLOCATION

MONITORING WELL RECORD

Well Permit No. 25 - 46505
Atlas Sheet Coordinates 25 : 45 : 428

OWNER IDENTIFICATION - Owner KIN-BUC INC
Address 200 CENTENNIAL AVE.
City PISCATAWAY State NJ Zip Code

WELL LOCATION - If not the same as owner please give address. Owner's Well No. 1G
County MIDDLESEX Municipality EDISON TWP
Address 383 Meadows Road, Edison, NJ Lot No. 400 Block No. 3C

TYPE OF WELL (as per Well Permit Categories) MONITORING
Regulatory Program Requiring Well CERCLA Date well completed 2 / 15 / 95
Case I.D. # NJD049860836
CONSULTING FIRM/FIELD SUPERVISOR (if applicable) Tele. #

WELL CONSTRUCTION

Total depth drilled 15.6 ft.
Well finished to 15 ft.
Borehole diameter:
Top 8 in.
Bottom 8 in.

	Depth to Top (ft.) [From land surface]	Depth to Bottom (ft.)	Diameter (inches)	Type and Material
Inner Casing	+4	5	2	Sch 40 PVC
Outer Casing (Not Protective Casing)				
Screen (Note slot size)	5	15	2	Sch 40 PVC .020
Tail Piece				
Gravel Pack	3	15.6	8	#2 Ricci
Annular Seal/Grout	0	5	8	Bentonite slurry
Method of Grouting	tremie			

Well was finished: [X] above grade [ ] flush mounted

If finished above grade, casing height (stick up) above land surface ____ ft.

Was steel protective casing installed? [ ] Yes [XX] No

Static water level after drilling – ft.
Water level was measured using –
Well was developed for N/A hours at N/A gpm
Method of development N/A
Was permanent pumping equipment installed? [ ] Yes [X] No
Pump capacity N/A gpm
Pump type: N/A
Drilling Method HSA
Drilling Fluid – Type of Rig B-61
Name of Driller Chad Chism
Health and Safety Plan submitted? [ ] Yes [X] No
Level of Protection used on site (circle one) None D C B A
N.J. License No. 0013753-001375
Name of Drilling Company HARDIN-HUBER, INC.

GEOLOGIC LOG (Copies of other geologic logs and/or geophysical logs should be attached.)

0 - 15.6 red gray dry stiff clay, some silt

I certify that I have drilled the above-referenced well in accordance with all well permit requirements and all applicable State rules and regulations.

Driller's Signature Chad Chism Date 2/15/95

COPIES: White - DEP Canary - Driller Pink - Owner Goldenrod - Health Dept.

EMCON/OWT, Inc.
One International Boulevard, Suite 700
Mahwah, NJ 07495-0086
201.512.5700
Fax 201.512.5786

Shaw™ EMCON/OWT, Inc.

April 22, 2003
Project 791186

Mr. Carl Januszkiewicz
Waste Management, Inc.
Kin-Buc Landfill Treatment Plant
383 Meadow Road
Edison, NJ 08817

Re: Hydraulic Monitoring for March 2003

Dear Mr. Januszkiewicz:

A site visit was completed on April 15, 2003 to download the March water level recorder data and obtain manual water level measurements. The following is an update of the hydraulic monitoring for the month of March 2003 at the Kin-Buc Landfill. This information is to be included in the quarterly report, which is to be submitted to the EPA by mid-May 2003.

The minimum, maximum, and average water elevations recorded at each well are included in Table 1. Table 2 shows the troll water elevations versus the manual water elevations. The continuous water level elevation data when compared with manual readings indicated that the miniTrolls are functioning properly and are recording accurate data with the exception of the miniTroll in Well 15G. The miniTroll in Well 15G was not communicating when attempting to download the data. The miniTroll was removed and replaced with a SP4000 Troll (previously in Well 13G). A representative from In-Situ, Inc. was contacted regarding the complications with the miniTroll.

Also, the data supplied for well SG-1 showed the same water level for the period. The automated water level recording device in this well needs to be checked so that accurate readings can be obtained in the future

The SP4000 Troll was removed from Well 13G and the replacement miniTroll (with new lithium batteries) was installed during this site visit.

Hydrographs have been prepared for each of the transect locations and are enclosed for your reference as Attachment No. 1. The water levels in wells on the outside of the slurry wall vary over the course of the day due to the tidal influence at the site. For clarity, Hydrograph Nos. 6 through 15 show the average water level in the well over a 24-hour period (12 hours before, and 12 hours after).

Refuse

As defined in the Record of Decision (ROD) for OU-1, the performance objective for the refuse unit calls for the pumping of leachate to establish inward gradients across the slurry wall with the additional benefit of reducing downward flow into the underlying sand and gravel unit. Based on the hydrographs the following is presented.

Transect 1-Refuse (1G/2G)/Hydrograph No. 1 - Intragradient conditions were not observed during the entire month of March. The average monthly water elevation for March at Well 1G (inside) and Well 2G (outside) was 11.24 and 12.15 feet msl, respectively. Water level elevation measurements taken from Leachate Collection Cleanouts Nos. 14 through 16 are included in Table 3, and indicate that the leachate collection system is functioning properly. The fact that the leachate collection system is functioning properly suggests significant capture of leachate. The evaluation of the hydraulic conditions in the refuse at Transect 1 is provided in Attachment No.2.

Transect 2-Refuse (3G/4G)/Hydrograph No. 2 – Intragradient conditions were maintained throughout the month of March. The average monthly water elevation for the month at Well 3G (inside) and Well 4G (outside) was 7.99 and 11.88 feet msl, respectively

Transect 3-Refuse (5G/6G)/Hydrograph No. 3 – Intragradient conditions were maintained throughout the month of March. The average monthly water elevation for the month of March at Well 5G (inside) and Well 6G (outside) was 9.73 and 13.87 feet msl, respectively.

Transect 4-Refuse Oil Seeps Area (13G/15G)/Hydrograph No. 4 – Intragradient conditions were maintained throughout the month of March. The average monthly water elevation for the month of March at Well 15G (inside) and Well 13G (outside) was 1.46 and 3.85 feet msl, respectively.

Transect 5-Refuse (9G/10G)/Hydrograph No. 5 – Intragradient conditions were maintained throughout the month of March. The average monthly water elevation for the month of March at Well 9G (inside) and Well 10G (outside) was 7.11 and 8.03 feet msl, respectively.

Sand and Gravel/Bedrock

For the sand and gravel unit, the performance objectives call for pumping of sand and gravel groundwater to prevent flow toward the slurry wall and to impose upward hydraulic gradients from the bedrock to the sand and gravel. An additional benefit would be the establishment of inward gradients across the slurry wall within the sand and gravel unit. The following is a description of the flow characteristics based on visual observation of the hydrographs.

Horizontal Flow

Transect 2-Sand and Gravel (3S/4S)/Hydrograph No. 6 – Intragradient conditions were not consistently maintained throughout the month of March. The average monthly water elevations for the month of March at Well 3S (inside) and Well 4S (outside) was 0.84 and 0.99 feet msl, respectively.

Transect 3-Sand and Gravel (5S/6S)/Hydrograph No. 7 – Slight intragradient conditions were maintained throughout the month of March. The average monthly water elevation for Well 5S (inside) and Well 6S (outside) was 1.58 and 1.69 feet msl, respectively.

Transect 4-Sand and Gravel (7S/8S)/Hydrograph No. 8- Intragradient conditions were maintained throughout the month of March. The average monthly water elevation for the month of March at Well 7S (inside) and Well 8S (outside) was 1.77 and 2.52 feet msl, respectively.

Transect 4 Sand and Gravel Oil Seeps Area (13S/15S)/Hydrograph No. 9 – Intragradient conditions were not evident during most of the month of March. The average monthly water elevation for the month of March at Well 15S (inside) and Well 13S (outside) was 1.80 and 2.22 feet msl, respectively. Water levels from Well 15G in the refuse unit are included on the hydrograph for comparison.

Vertical Flow-Inside Slurry Wall

Transect 2-Vertical Gradient (3S/3RR)-Inside/Hydrograph No.10 – Upward gradient conditions were not observed between the bedrock and overlying sand & gravel units inside the slurry wall for most of the month of March. The average monthly water elevation for the month of March at Well 3S (sand & gravel) and Well 3RR (bedrock) was 0.84 and 0.66 feet msl, respectively.

Transect 3-Vertical Gradient (5R/5S)-Inside/Hydrograph No. 12 – Upward gradient conditions were observed between the bedrock and overlying sand & gravel units inside the slurry wall for the month of March. The average monthly water elevation for the month of March at Well 5S (sand & gravel) and Well 5R (bedrock) was 1.58 and 1.76 feet msl, respectively.

Transect 4-Vertical Gradient (7R/7S)-Inside/Hydrograph No. 14 – Slight upward gradient conditions were observed between the bedrock and overlying sand & gravel units inside the slurry wall throughout the month of March. The average monthly water elevation for the month of March at Well 7S (sand & gravel) and Well 7R (bedrock) was 1.77 and 1.84 feet msl, respectively. The difference in average monthly water elevations was less than 0.1 feet.

Vertical Flow-Outside Slurry Wall

Transect 2-Vertical Gradient (4S/4R)-Outside/Hydrograph No. 11 – Upward gradient conditions were not observed between the bedrock and overlying sand & gravel units outside the slurry wall for the month of March. The average monthly water elevation for the month of March at Well 4S (sand & gravel) and Well 4R (bedrock) was 0.99 and 0.80 feet msl, respectively.

Transect 3-Vertical Gradient (6R/6S)-Outside/Hydrograph No. 13 – Upward gradient conditions were observed between the bedrock and overlying sand & gravel units outside the slurry wall for the month of March. The average monthly water elevation for the month of March at Well 6S (sand & gravel) and Well 6R (bedrock) was 1.69 and 1.82 feet msl, respectively.

Transect 4-Vertical Gradient (8RR/8S)-Outside/Hydrograph No. 15 – Upward gradient conditions were not observed between the bedrock and overlying sand & gravel units outside the slurry wall throughout the month of March. The average monthly water elevation for the month of March at both Well 8S (sand & gravel) and Well 8RR (bedrock) was 2.52 and 2.46 feet msl, respectively. The difference in average monthly water elevations for March was 0.06 feet, respectively.

An initial review of the hydrographs indicates that certain performance objectives associated with the sand and gravel and bedrock units may not be met, specifically associated with the uniform achievement of upward gradients from the bedrock to the overlying sand and gravel inside the wall (e.g. Hydrograph 10), and inward gradients across the slurry wall within the sand and gravel (Hydrographs 6 and 9). However previous investigations performed at the site would indicate that complete control of OU-1 groundwater can be achieved notwithstanding indications of downward flow from the sand and gravel to the bedrock, or outward flow across the slurry wall within the sand and gravel unit. This is based on the findings of the considerable pumping influence of the sand and gravel pumping wells, in particular S&G#2, in achieving hydraulic control at the site (see Groundwater Pumping Well Performance Evaluation Report, July 2000).

The influence of the pumping well can be demonstrated by review of a plan view groundwater contour map of the sand and gravel (Figure 1) and equipotential profiles and vector diagrams (Figures 1, 2, 3, and 4) that have been prepared. For this evaluation, a snapshot of groundwater elevations from the monitoring wells and pumping wells was obtained for March 19, 2003. At this time, S&G#2 was pumping at a rate of about 8 gallons per minute (gpm), while S&G#3 was pumping at a rate of 3 gpm. This resulted in a total of approximately 11 gpm or about 15,829 gallons per day. There was a downward vertical gradient observed the majority of the time between the sand and gravel and the bedrock inside and outside the slurry wall at Transect No.2 in March as evidenced by higher heads in the sand and gravel wells relative to bedrock wells. Periodically, there was also a higher head within the sand and gravel inside the slurry wall relative to the sand and gravel outside the slurry wall at Transect No. 2 in March.

Figures 1-4 incorporate the heads induced by pumping and show the considerable pumping influence of S&G#2. Specifically, groundwater flowing downward from the sand and gravel into the bedrock subsequently flows toward the pumping well. This occurs both inside and outside of the slurry wall. Also, groundwater within the sand and gravel unit flows toward the pumping well. The considerable pumping influence demonstrated at S&G#2, in conjunction with the fact that natural groundwater gradients in both the sand & gravel and bedrock flow predominantly towards the area of S&G#2, result in the complete capture of OU-1 groundwater at these pumping rates.

Groundwater and Leachate Collection

Based on data provided by U.S. Filter, the following volumes of groundwater and leachate were extracted from the sand & gravel wells and leachate collection system for the period from March 1 to March 31, 2003:

S&G No. 1 Groundwater	S&G No. 2 Groundwater	S&G No. 3 Groundwater	S&G No. 4 Groundwater	Leachate
0 gal.	368,694 gal.	118,399 gal.	4,626 gal.	47,044 gal.
0 gpd	11,893 gpd	3,819 gpd	149 gpd	1,517 gpd

For the month of March, a total of 491,719 gallons of groundwater was collected. The average daily groundwater extraction rate for all of the wells was 15,862 gpd. The extraction rate from S&G No. 2 was 11,893 gpd, the extraction rate from S&G No. 3 was 3,819 gpd, and the extraction rate from S&G No. 4 was 149 gpd. The leachate extraction rate was 1,517 gpd for the month of March.

CONCLUSIONS

Intragradient conditions were maintained in the refuse unit at Transects 2, 3, 4, and 5.

Intragradient conditions were not maintained throughout the month of March by the monitoring wells at Transect 1, although levels in the leachate collection system indicate intragradient conditions are present at this location.

Hydraulic control was maintained within OU-1 based on the analysis of the significant influence of S&G#2 in acting as a hydraulic sink for sand and gravel and bedrock groundwater. Groundwater flow in the sand and gravel and bedrock is ultimately captured by the pumping wells (S&G#2 and S&G#3) resulting in overall containment of groundwater in OU-1.

In view of the analysis presented herein, it is recommended that the combined groundwater pumping rates in the sand and gravel be maintained at 15,000 gpd with S&G#2 and S&G#3 pumping at 10,000 gpd and 5,000 gpd, respectively. These lower pumping rates will be evaluated to confirm continued hydraulic control of OU-1 groundwater.

We trust you find this information useful. If you have any questions, please do not hesitate to contact us.

EMCON/OWT, INC.

Timothy S Pagano

Tim Pagano, CPG
Senior Hydrogeologist

Laura Kisala

Laura Kisala
Environmental Scientist

Attachments

cc: Glenn Grieb, US Filter
Steve Golberg, EMCON/OWT, Inc.

XREF Files: MAKBBDA1 IMAGE Files:
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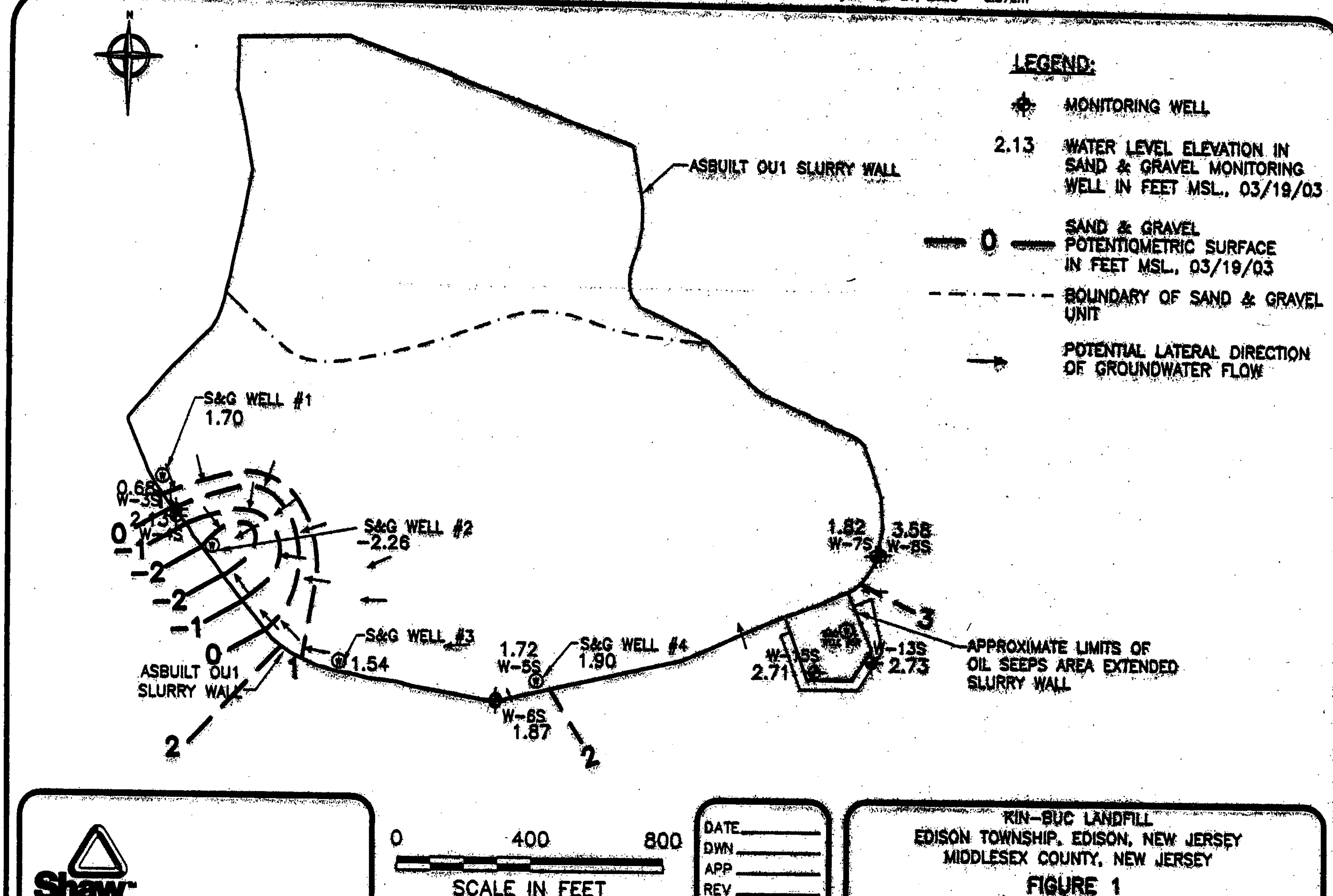

Shaw™

DATE
DWN
APP
REV
PROJECT NO.
791186

KIN-BUC LANDFILL
EDISON TOWNSHIP, EDISON, NEW JERSEY
MIDDLESEX COUNTY, NEW JERSEY

FIGURE 1
SAND & GRAVEL UNIT
POTENTIOMETRIC SURFACE

XREF Files: makbBDA1 IMAGE Files:
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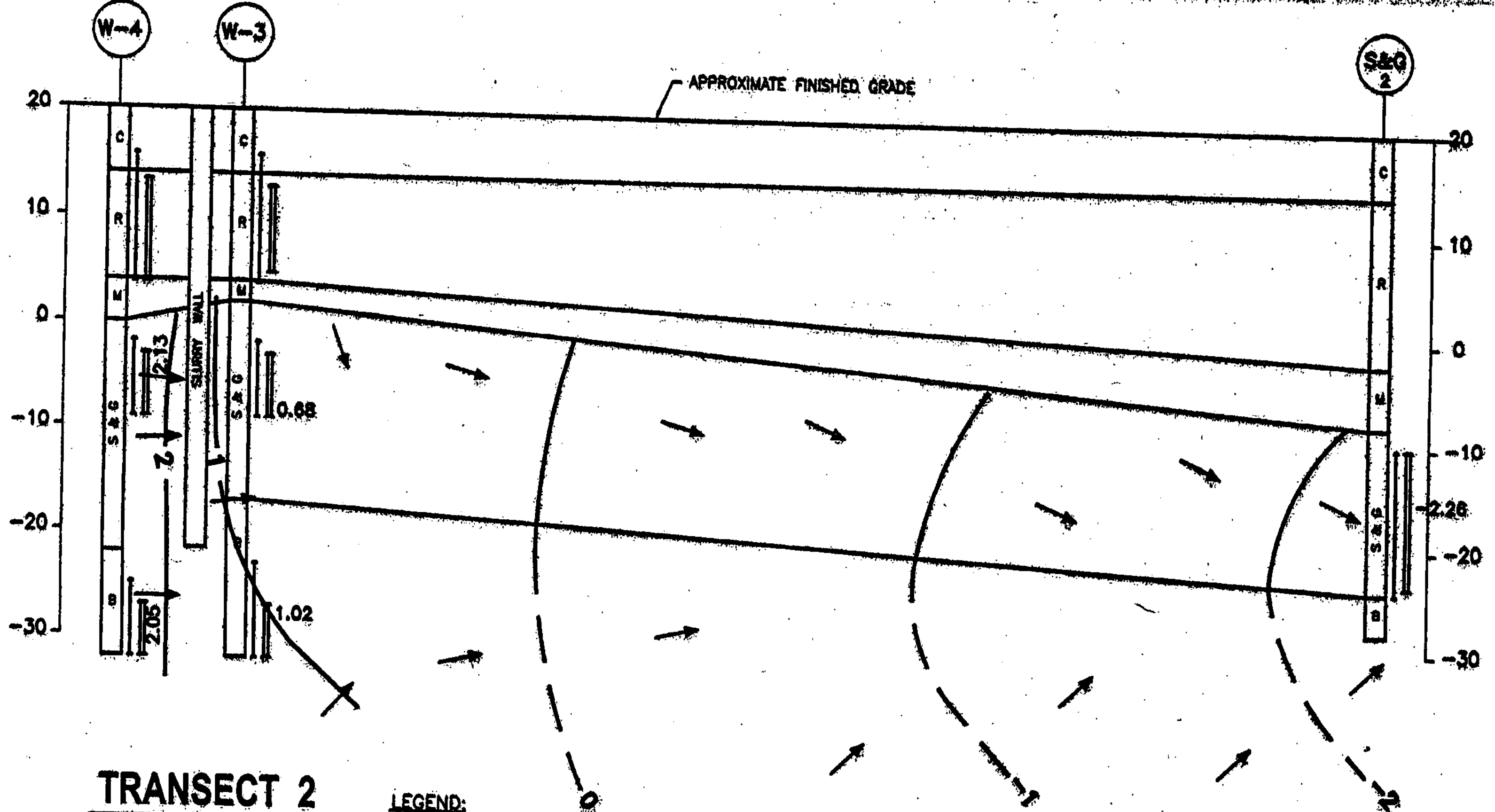

TRANSECT 2

SCALE: N.T.S.

LEGEND:

B	- BEDROCK	1.02	ELEVATION OF WATER LEVEL IN MONITORING WELL, IN FEET MSL., 03/19/03
C	- CAP		
R	- REFUSE	—1—	GROUNDWATER EQUIPOTENTIAL IN BEDROCK AND SAND & GRAVEL, IN FEET MSL., 03/19/03
M	- MEADOW MAT		
S & G	- SAND & GRAVEL	→	POTENTIAL VERTICAL DIRECTION OF GROUNDWATER FLOW.

SAND PACK INTERVAL

SCREENED INTERVAL

Shaw™

DATE
DWN
APP
REV
PROJECT NO.
791186

KIN-BUC LANDFILL
EDISON TOWNSHIP, EDISON, NEW JERSEY
MIDDLESEX COUNTY, NEW JERSEY

FIGURE 2
TRANSECT 2
HYDROGEOLOGIC CROSS SECTION ANALYSIS

XREF Files: makbBDA1 IMAGE Files:
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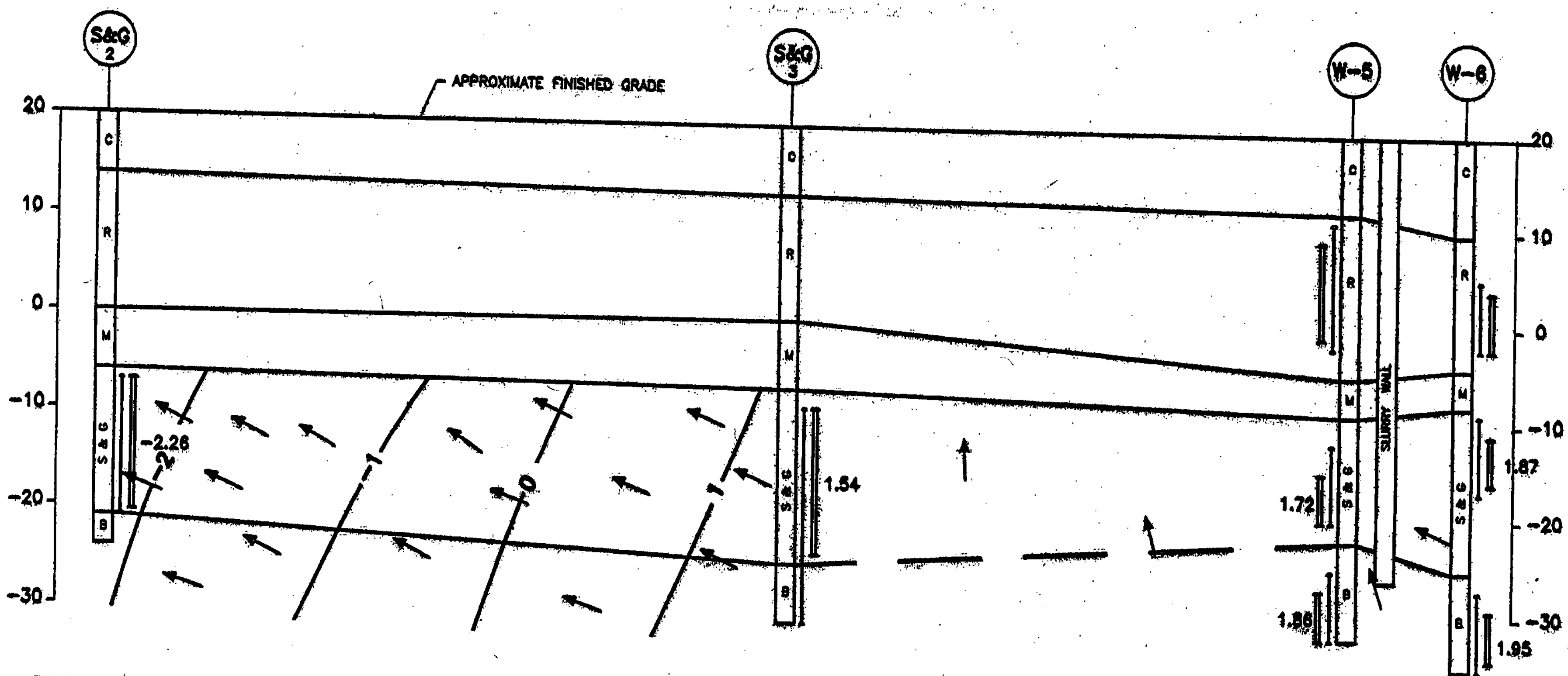

TRANSECT 3

SCALE: N.T.S.

LEGEND:

B - BEDROCK	-2.26	ELEVATION OF WATER LEVEL IN MONITORING WELL, IN FEET MSL, 03/19/03
C - CAP		
R - REFUSE	—— -2 ——	GROUNDWATER EQUIPOTENTIAL IN BEDROCK AND SAND & GRAVEL, IN FEET MSL, 03/19/03
M - MEADOW MAT		
S & G - SAND & GRAVEL	——→	POTENTIAL VERTICAL DIRECTION OF GROUNDWATER FLOW.

SAND PACK INTERVAL

SCREENED INTERVAL

Shaw™

DATE ____
DWN ____
APP ____
REV ____
PROJECT NO.
791186

KIN-BUC LANDFILL
EDISON TOWNSHIP, EDISON, NEW JERSEY
MIDDLESEX COUNTY, NEW JERSEY

FIGURE 3
TRANSECT 3
HYDROGEOLOGIC CROSS SECTION ANALYSIS

XREF Files: makbBDA1 IMAGE Files:
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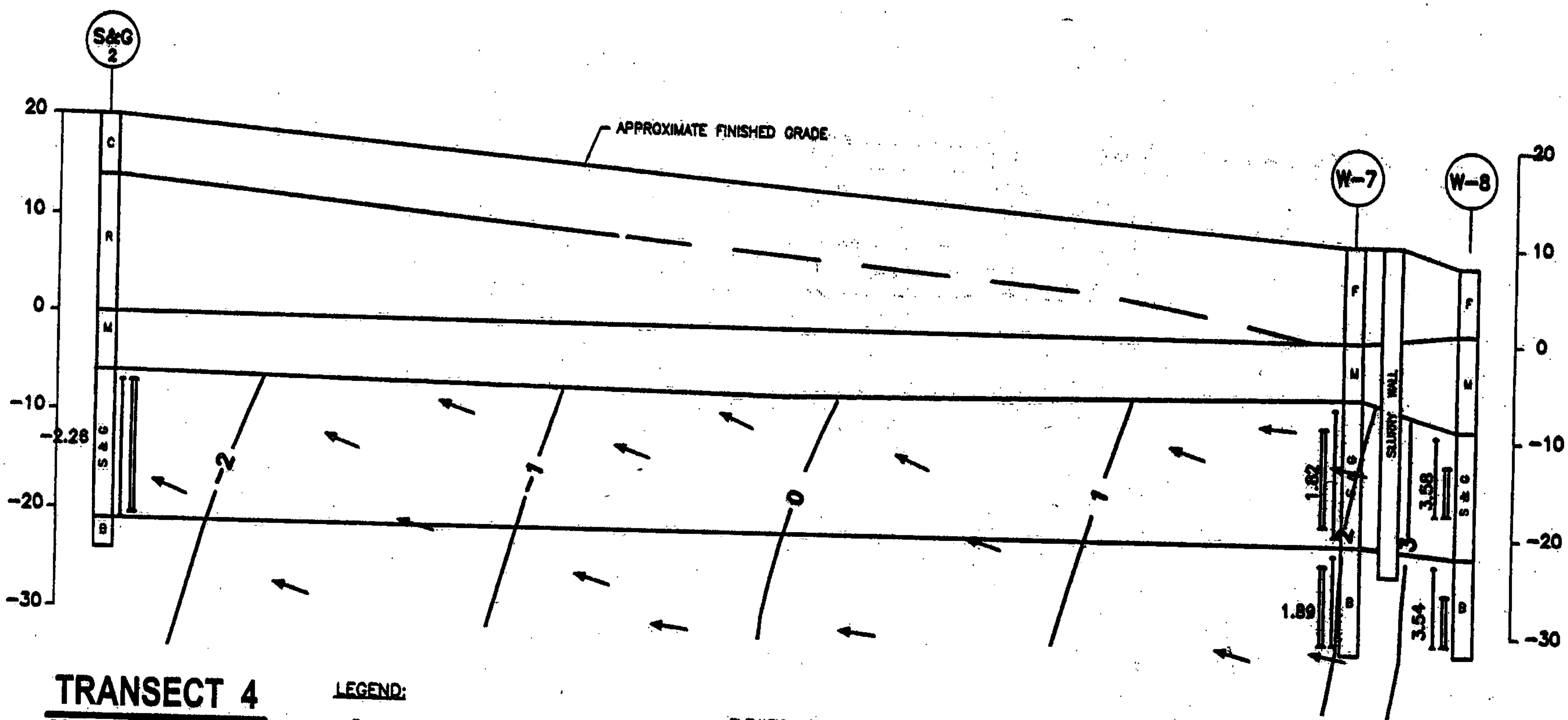

TRANSECT 4

SCALE: N.T.S.

LEGEND:

B - BEDROCK

C - CAP

R - REFUSE

M - MEADOW MAT

S & G - SAND & GRAVEL

1.82 ELEVATION OF WATER LEVEL IN MONITORING WELL, IN FEET MSL, 03/19/03

—— -2 —— GROUNDWATER EQUIPOTENTIAL IN BEDROCK AND SAND & GRAVEL, IN FEET MSL, 03/19/03

← POTENTIAL VERTICAL DIRECTION OF GROUNDWATER FLOW.

SAND PACK INTERVAL

SCREENED INTERVAL

Shaw™

DATE______
DWN______
APP______
REV______
PROJECT NO. 791186

KIN-BUC LANDFILL
EDISON TOWNSHIP, EDISON, NEW JERSEY
MIDDLESEX COUNTY, NEW JERSEY
FIGURE 4
TRANSECT 4
HYDROGEOLOGIC CROSS SECTION ANALYSIS

Table 1
KinBuc Landfill Operable Units 1 and 2
Continuous Hydraulic Monitoring Results
Minimum/Maximum/Average Water Elevations

Inside Slurry Wall					Outside Slurry Wall				
Well ID	Monitoring Period	Minimum Recorded Water Elevation (ft)	Maximum Recorded Water Elevation (ft)	Average Water Elevation (ft)	Well ID	Monitoring Period	Minimum Recorded Water Elevation (ft)	Maximum Recorded Water Elevation (ft)	Average Water Elevation (ft)
W-1G	January	11.20	11.24	11.22	W-2G	January	11.31	13.87	12.31
	February	11.23	11.28	11.25		February	10.49	11.93	11.06
	March	11.23	11.34	11.24		March	11.85	12.42	12.15
	1st Quarter	11.20	11.34	11.24		1st Quarter	10.49	13.87	11.84
W-3G	January	7.78	8.53	8.06	W-4G	January	11.16	12.23	11.57
	February	7.43	8.37	7.89		February	10.98	12.02	11.41
	March	7.61	8.31	7.99		March	11.57	12.13	11.88
	1st Quarter	7.43	8.53	7.99		1st Quarter	10.98	12.23	11.62
W-3S	January	-0.56	1.77	0.46	W-4S	January	-1.23	3.08	0.52
	February	-3.25	1.52	-0.03		February	-1.40	2.22	0.27
	March	0.12	1.58	0.84		March	-0.22	2.64	0.99
	1st Quarter	-3.25	1.77	0.41		1st Quarter	-1.40	3.08	0.58
W-5G	January	9.55	10.33	9.83	W-6G	January	13.10	14.27	13.54
	February	9.29	10.17	9.72		February	12.85	14.31	13.47
	March	9.41	10.09	9.73		March	13.31	14.44	13.87
	1st Quarter	9.29	10.33	9.76		1st Quarter	12.85	14.44	13.63
W-5S	January	0.35	2.76	1.27	W-6S	January	0.48	2.90	1.37
	February	-0.16	2.13	0.92		February	-0.04	2.26	1.03
	March	0.95	2.45	1.58		March	1.04	2.59	1.69
	1st Quarter	-0.16	2.76	1.27		1st Quarter	-0.04	2.90	1.37
W-7S	January	0.76	2.81	1.53	W-8S	January	1.71	5.70	2.37
	February	0.20	2.19	1.17		February	1.39	4.21	2.12
	March	1.22	2.53	1.77		March	-3.53	4.72	2.52
	1st Quarter	0.20	2.81	1.50		1st Quarter	-3.53	5.70	2.35
W-15S	January	2.00	4.02	2.94	W-13S	January	1.28	4.08	2.00
	February	0.64	3.11	2.00		February	0.93	2.98	1.72
	March	-0.24	3.29	1.80		March	1.70	3.62	2.22
	1st Quarter	-0.24	4.02	2.25		1st Quarter	0.93	4.08	1.99
W-15G	January	1.34	1.63	1.46	W-13G	January	3.04	4.24	3.77
	February	1.29	1.61	1.45		February	3.36	4.30	3.71
	March	NA (1)	NA (1)	1.46 (2)		March	3.64	4.16	3.85
	1st Quarter	1.29	1.63	1.46		1st Quarter	3.04	4.30	3.78
W-9G	January	6.87	7.71	7.29	W-10G	January	8.03	8.33	8.20
	February	6.74	7.14	6.92		February	7.79	8.05	7.92
	March	6.84	7.34	7.11		March	7.86	8.21	8.03
	1st Quarter	6.74	7.71	7.11		1st Quarter	7.79	8.33	8.06
W-3RR	January	-0.95	2.24	0.28	W-4R	January	-1.46	3.02	0.41
	February	-1.58	1.93	-0.06		February	-1.69	2.18	0.13
	March	-0.38	1.93	0.66		March	-0.56	2.54	0.80
	1st Quarter	-1.58	2.24	0.28		1st Quarter	-1.69	3.02	0.43

Table 1
KinBuc Landfill Operable Units 1 and 2
Continuous Hydraulic Monitoring Results
Minimum/Maximum/Average Water Elevations

Inside Slurry Wall					Outside Slurry Wall				
Well ID	Monitoring Period	Minimum Recorded Water Elevation (ft)	Maximum Recorded Water Elevation (ft)	Average Water Elevation (ft)	Well ID	Monitoring Period	Minimum Recorded Water Elevation (ft)	Maximum Recorded Water Elevation (ft)	Average Water Elevation (ft)
W-5R	January	NA [1]	NA [1]	0.74 [2]	W-6R	January	0.66	3.04	1.53
	February	-0.04 [3]	2.29 [3]	1.08 [3]		February	0.11	2.40	1.18
	March	1.12	2.61	1.76		March	1.20	2.70	1.82
	1st Quarter	-0.04	2.61	1.19		1st Quarter	0.11	3.04	1.52
W-7R	January	0.83	2.86	1.60	W-8RR	January	1.67	5.64	2.34
	February	-1.26	2.24	1.23		February	1.38	4.17	2.10
	March	1.29	2.59	1.84		March	1.91	4.65	2.46
	1st Quarter	-1.26	2.86	1.57		1st Quarter	1.38	5.64	2.30

Notes:
(1) Troll malfunctioned, data was not collected.
(2) Water elevation calculated from manual water levels.
(3) Water elevation data is from 2/14 - 2/28.

Table 2
KinBuc Landfill Operable Unit 1
March 2003
Troll Water Elevations vs. Manual Water Elevations

OU 1 Well ID	April 1, 2003		
	Troll	Manual	Difference
W-1G	11.24	11.27	0.03
W-2G	12.04	12.06	0.02
W-3G	7.97	7.73	0.24
W-3S	0.66	0.64	0.02
W-3RR	0.54	0.65	0.11
W-4G	11.93	11.63	0.30
W-4S	1.04	1.07	0.03
W-4R	0.92	1.07	0.15
W-5G	9.72	9.82	0.10
W-5S	1.44	1.48	0.04
W-5R	1.39	1.43	0.04
W-6G	13.65	13.67	0.02
W-6S	1.56	1.62	0.06
W-6R	1.62	1.66	0.04
W-7S	1.70	1.73	0.03
W-7R	1.79	1.81	0.02
W-8S	2.35	2.35	0.00
W-8RR	2.30	2.28	0.02
W-9G	7.29	7.26	0.03
W-10G	8.22	8.26	0.04
W-13G	6.81	6.84	0.03
W-13S	2.06	2.11	0.05
W-15G	NA	1.46	NA
W-15S	2.18	2.21	0.03

Note: Troll data not available for Well 15G

Table 3
Kin-Buc Landfill
Leachate Cleanout Monitoring
2003

Cleanout location	14N		14E		15N		15E		16N		16E	
Elevation @ Sea Level	22.87		22.77		26.51		26.51		31.36		31.32	
	depth to water	elevation	depth to water	elevation	depth to water	elevation	depth to water	elevation	depth to water	elevation	depth to water	elevation
Elevation Average		10.09		10.06		9.85		9.93		na		na
DATE												
12/10/2001	12.5	10.37	12.42	10.35	16.31	10.20	16.33	10.18	dry	na	dry	na
1/3/2002	12.37	10.50	12.31	10.46	16.21	10.30	16.22	10.29	dry	na	dry	na
2/13/2002	12.70	10.17	12.63	10.14	16.57	9.94	16.62	9.89	dry	na	dry	na
3/27/2002	12.61	10.26	12.55	10.22	16.52	9.99	16.47	10.04	dry	na	dry	na
4/19/2002	12.75	10.12	12.68	10.09	16.64	9.87	16.61	9.90	dry	na	dry	na
5/3/2002	13.03	9.84	12.96	9.81	16.97	9.54	16.94	9.57	dry	na	dry	na
6/5/2002	13.04	9.83	12.97	9.80	16.63	9.88	16.95	9.56	dry	na	dry	na
7/8/2002	12.86	10.01	12.79	9.98	16.77	9.74	16.72	9.79	dry	na	dry	na
8/2/2002	12.86	10.01	12.79	9.98	16.8	9.71	15.73	10.78	dry	na	dry	na
9/5/2002	12.86	10.01	12.78	9.99	16.77	9.74	16.75	9.76	dry	na	dry	na
9/26/2002	12.94	9.93	12.85	9.92	16.85	9.66	16.83	9.68	dry	na	dry	na
11/6/2002	12.64	10.23	12.58	10.19	16.59	9.92	16.48	10.03	dry	na	dry	na
12/6/2002	13.02	9.85	12.94	9.83	16.97	9.54	16.95	9.56	dry	na	dry	na
1/2/2003	13.07	9.80	13.00	9.77	17.03	9.48	17.01	9.50	dry	na	dry	na
2/12/2003	13.20	9.67	13.12	9.65	17.19	9.32	17.16	9.35	dry	na	dry	na
3/4/2003	13.21	9.66	13.15	9.62	17.22	9.29	17.20	9.31	dry	na	dry	na
4/1/2003	12.90	9.97	12.83	9.94	16.82	9.69	16.79	9.72	dry	na	dry	na

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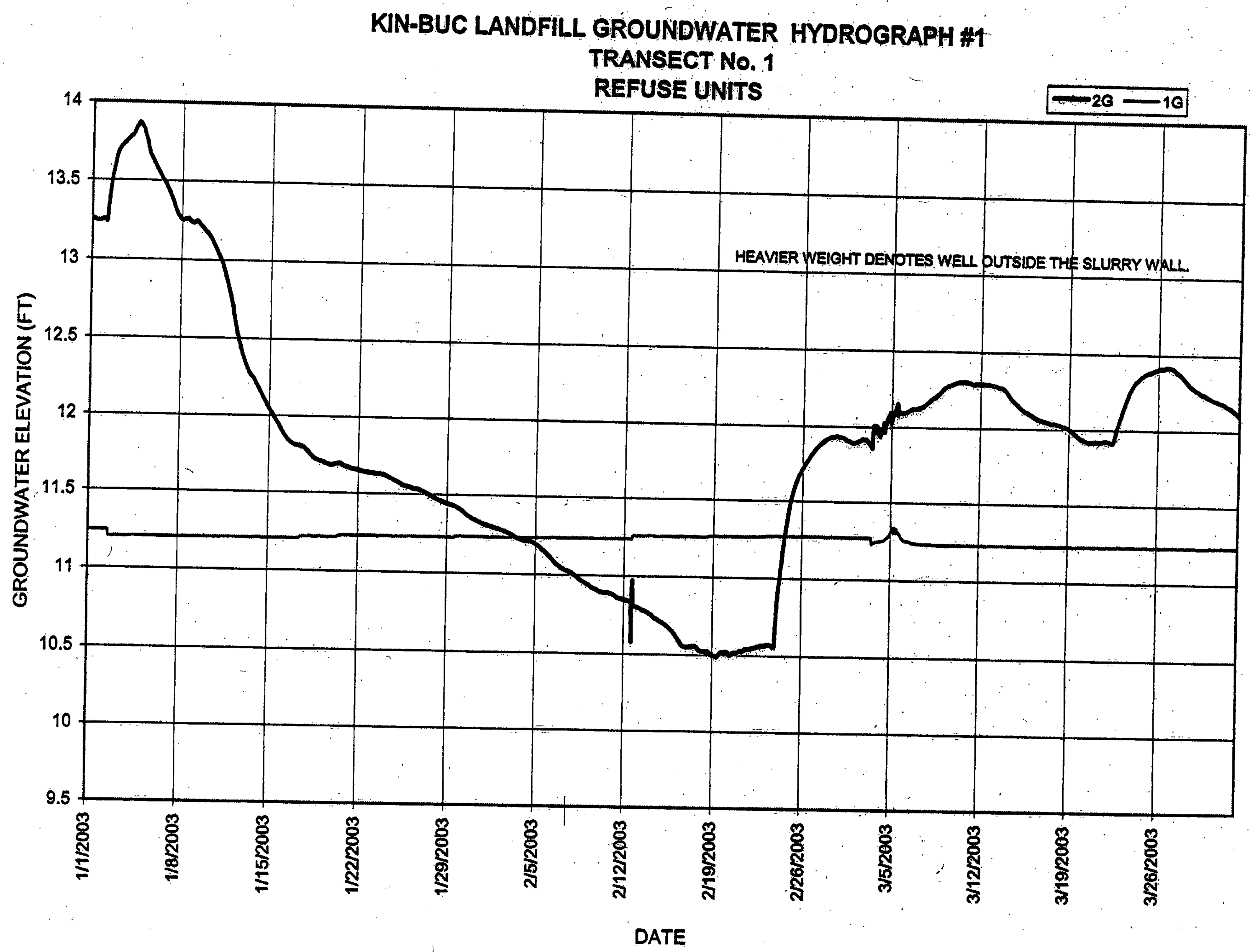

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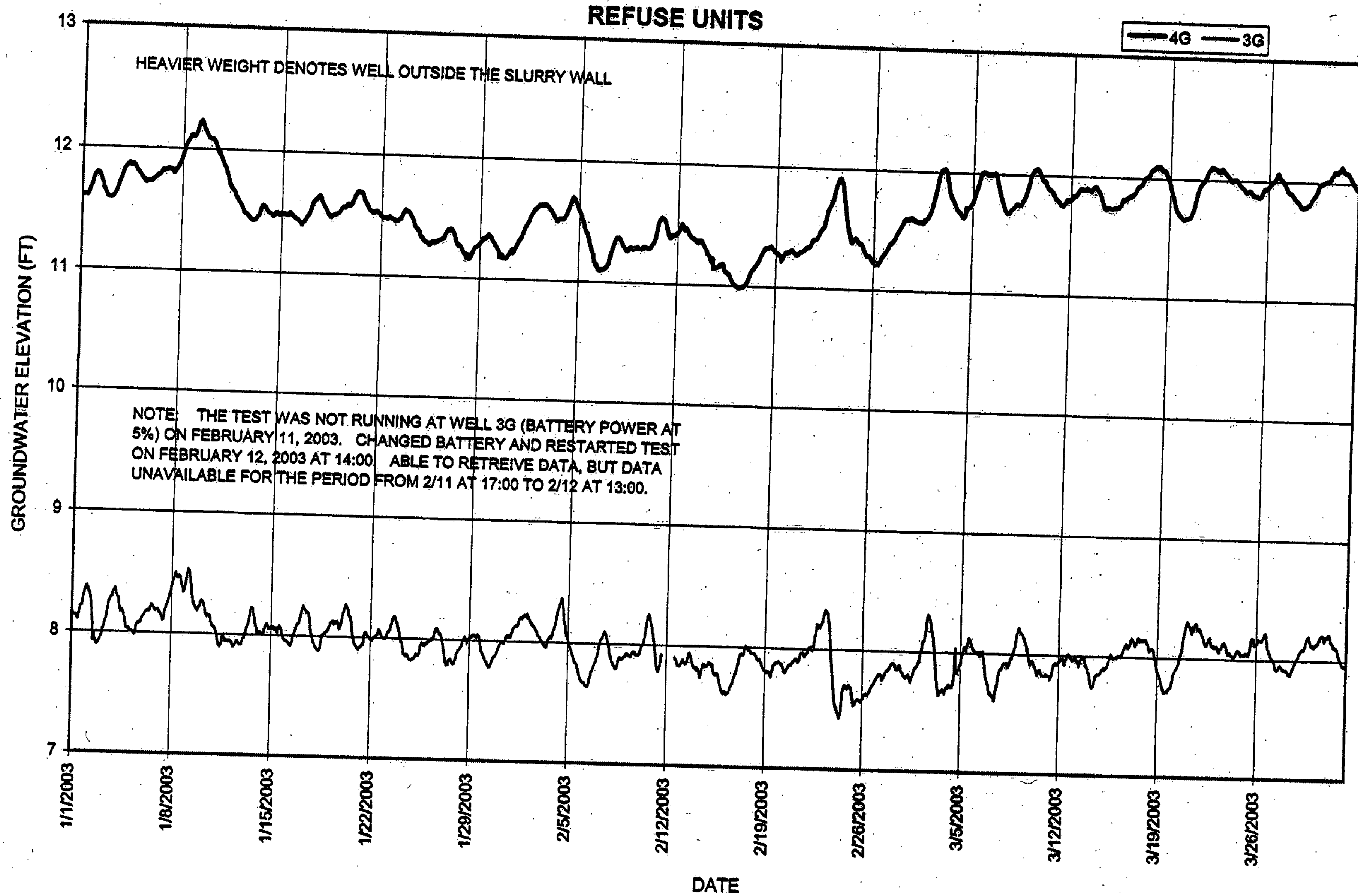

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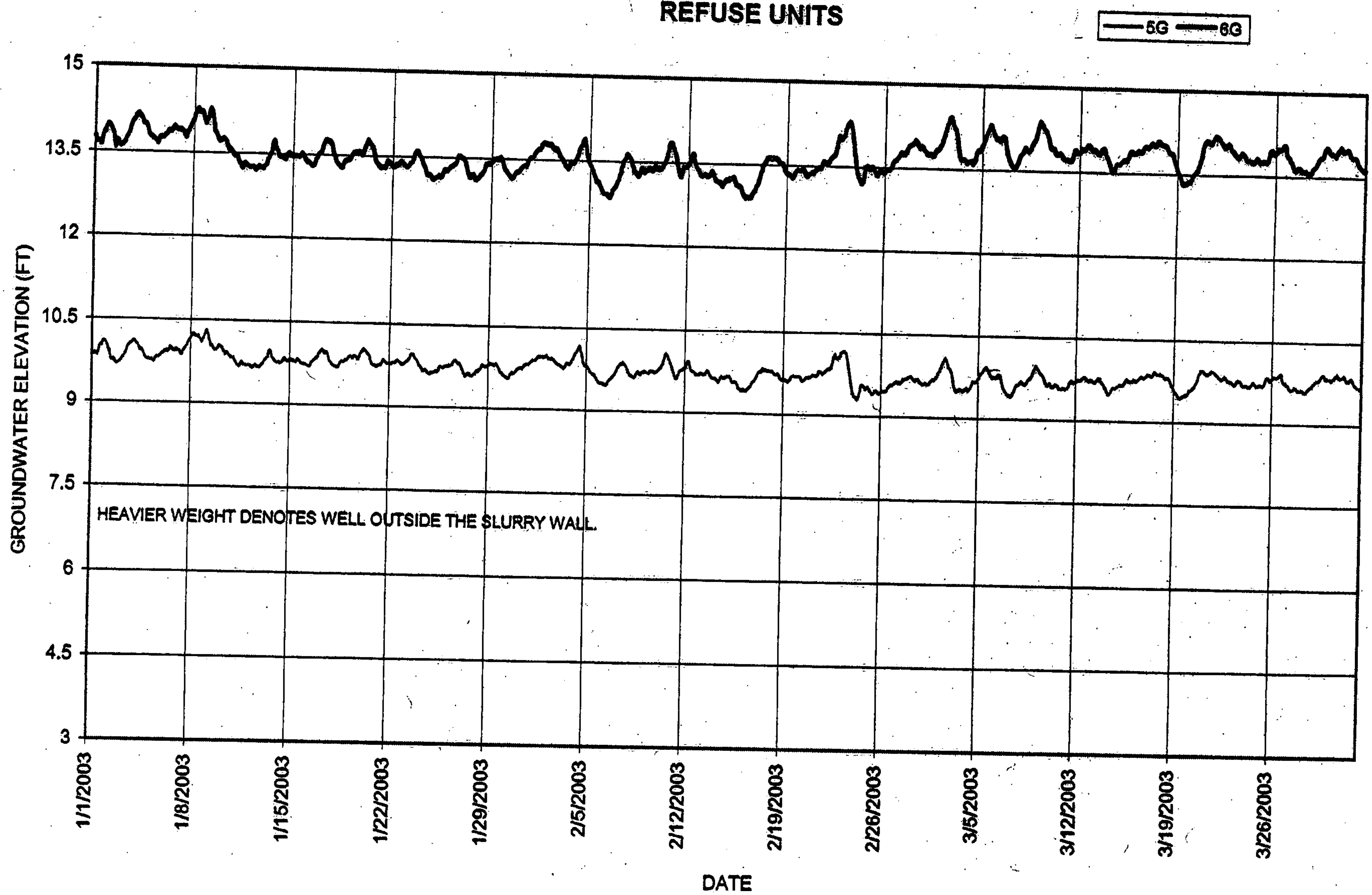

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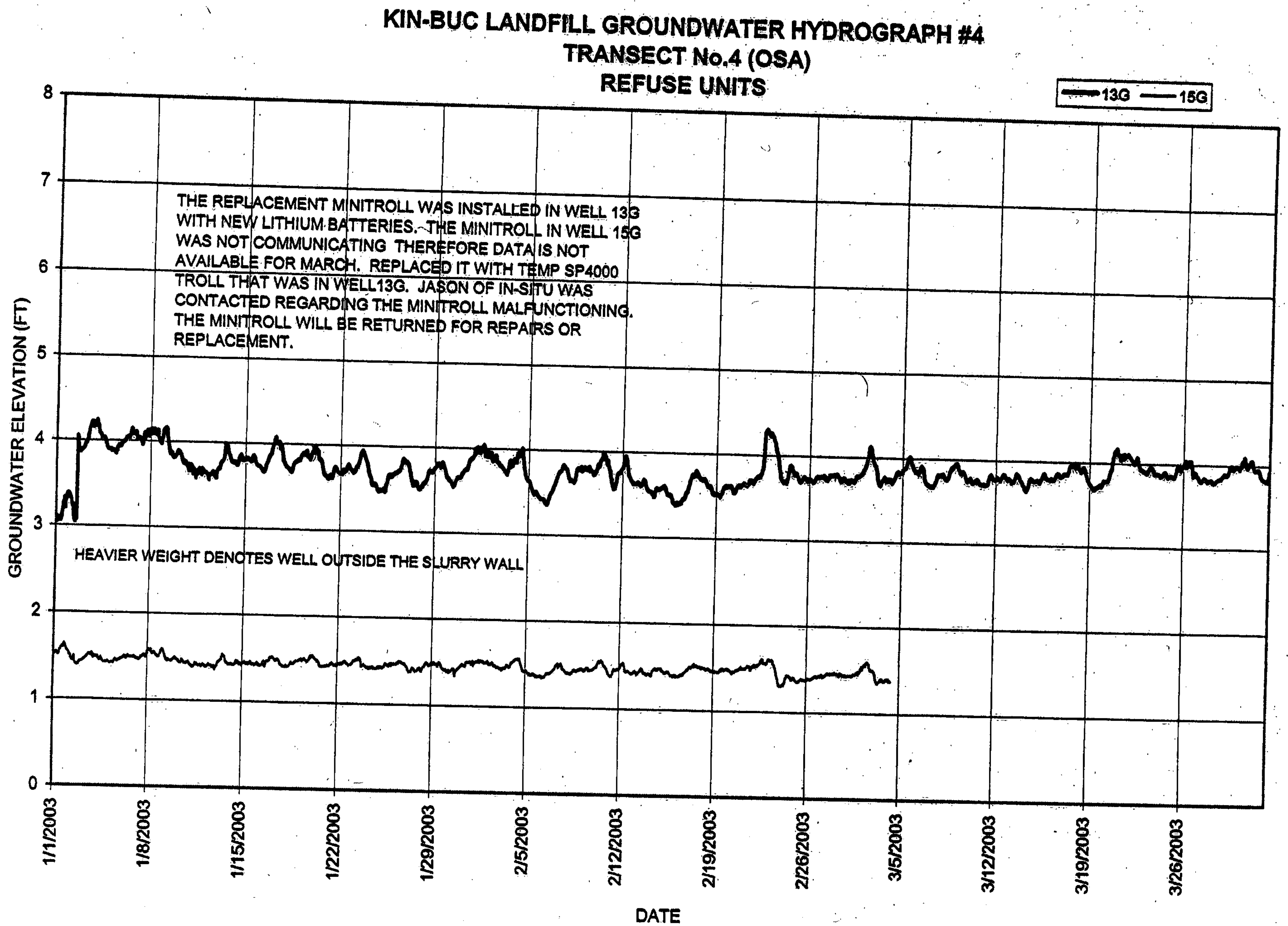

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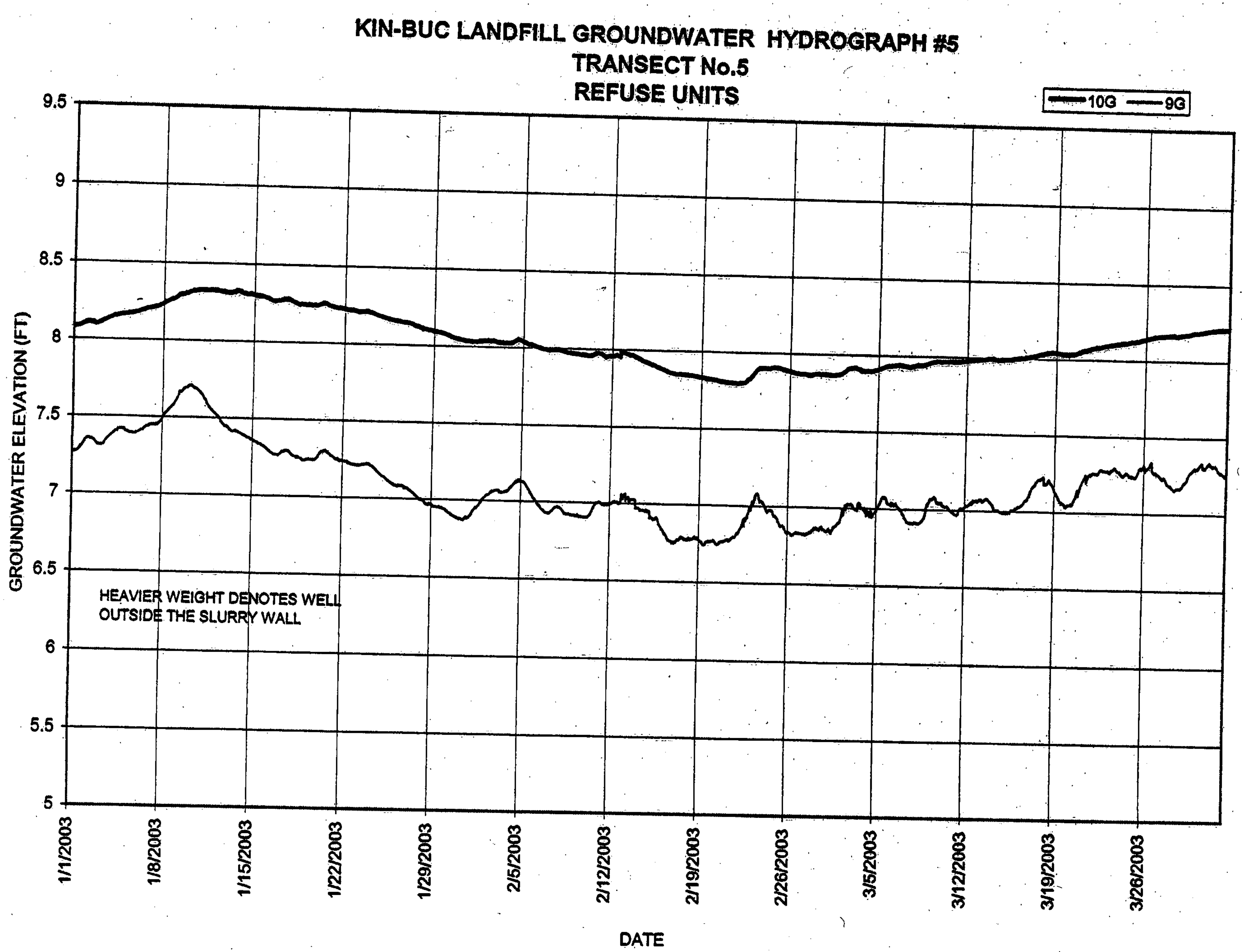

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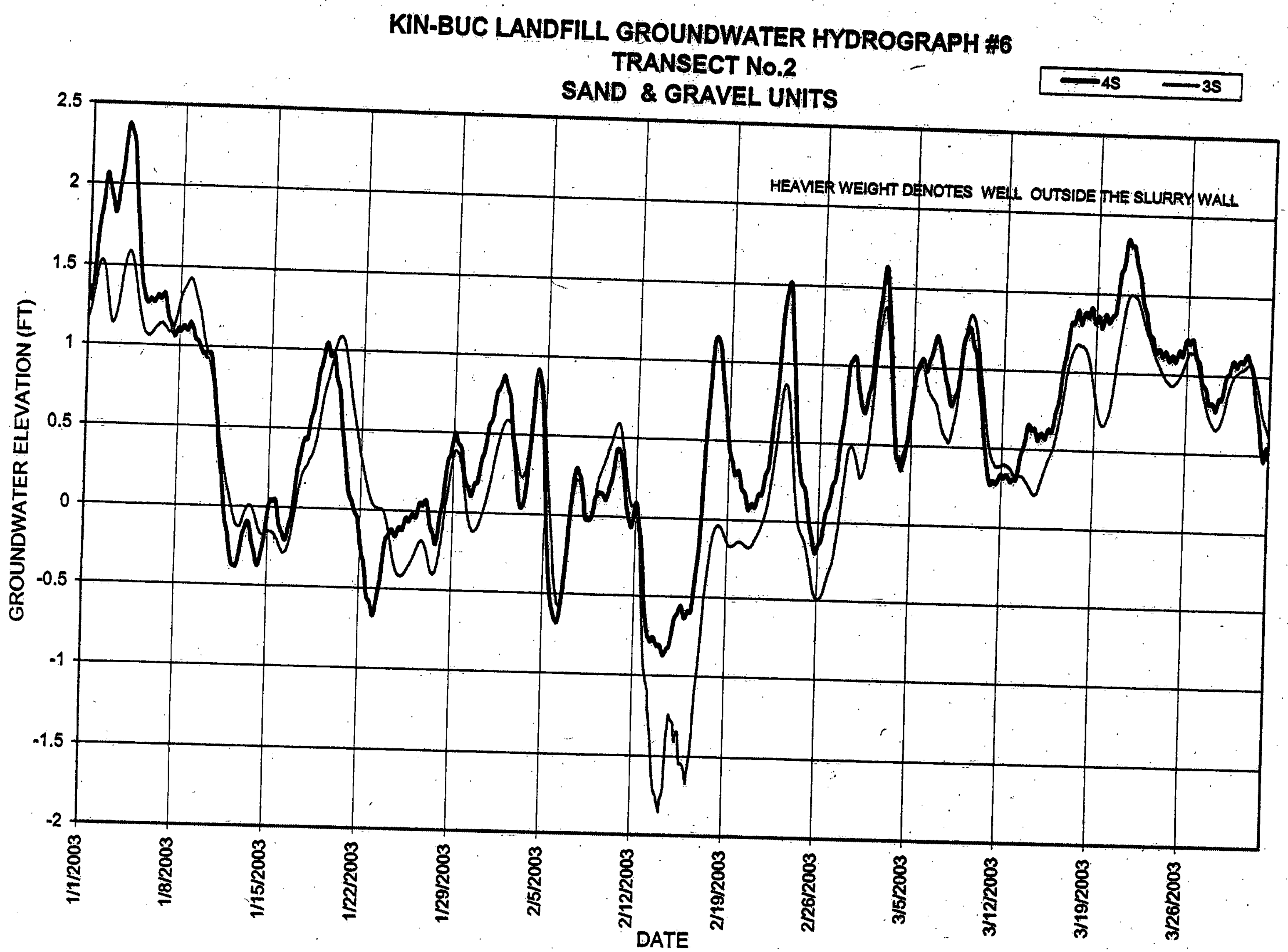

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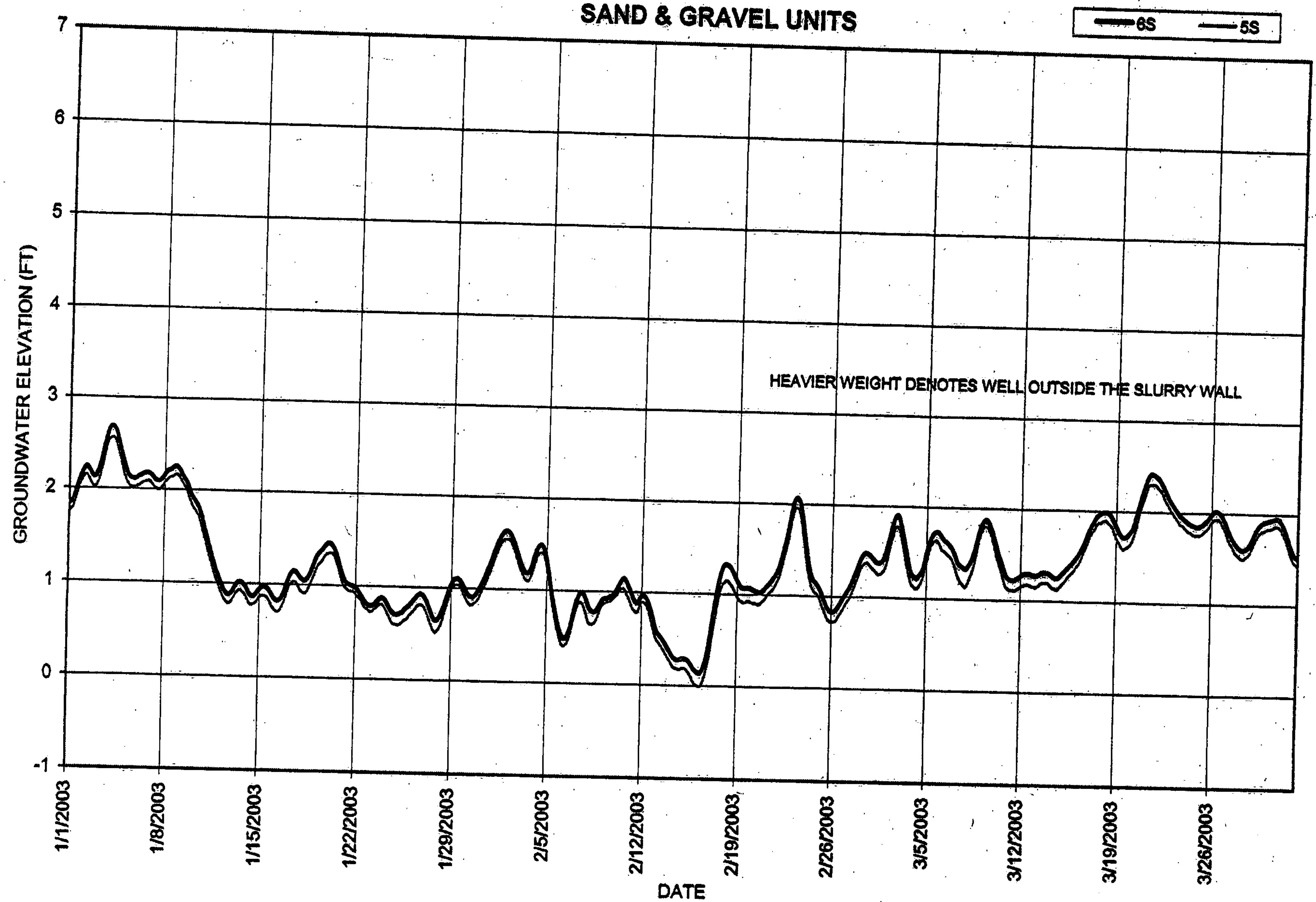

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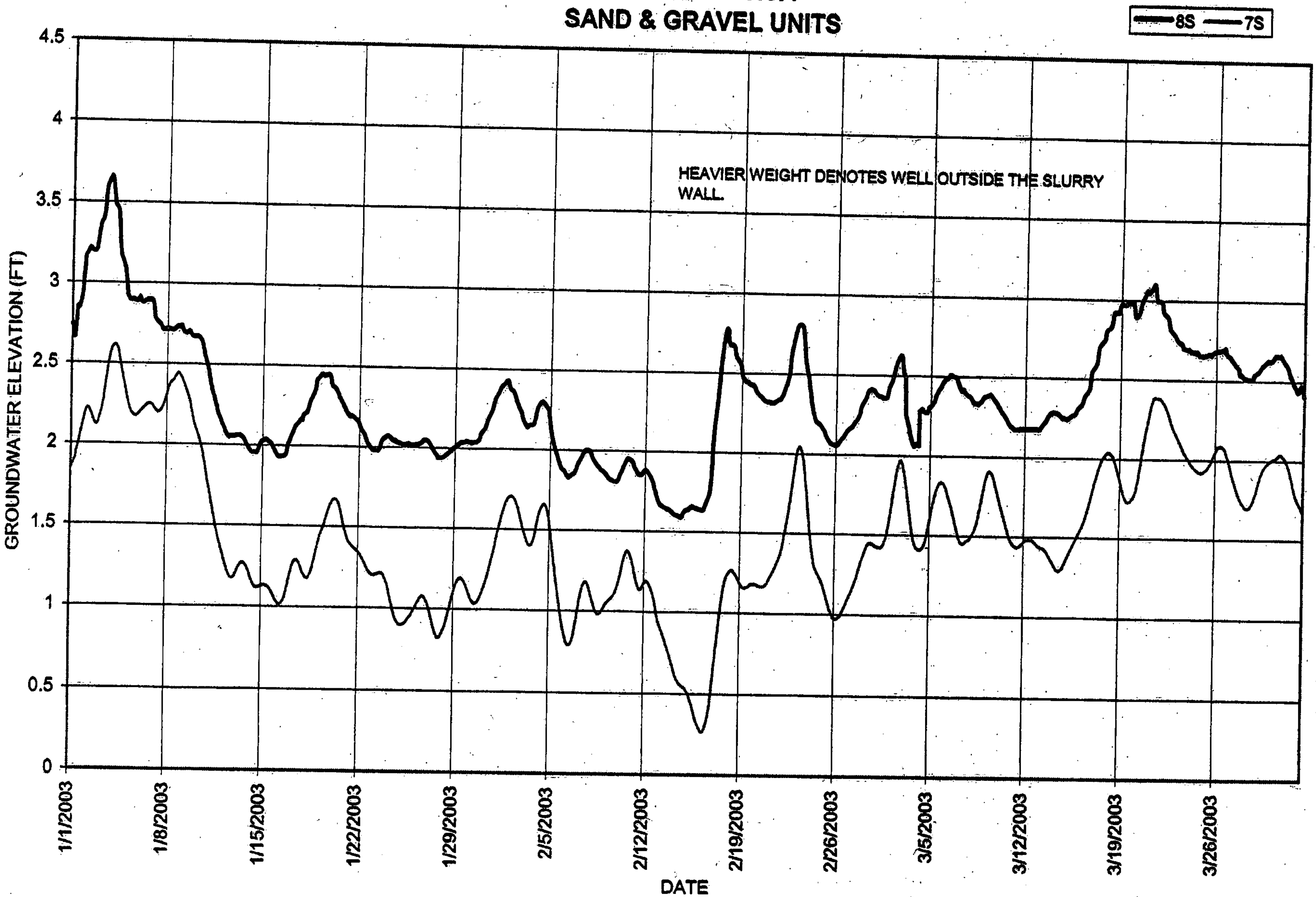

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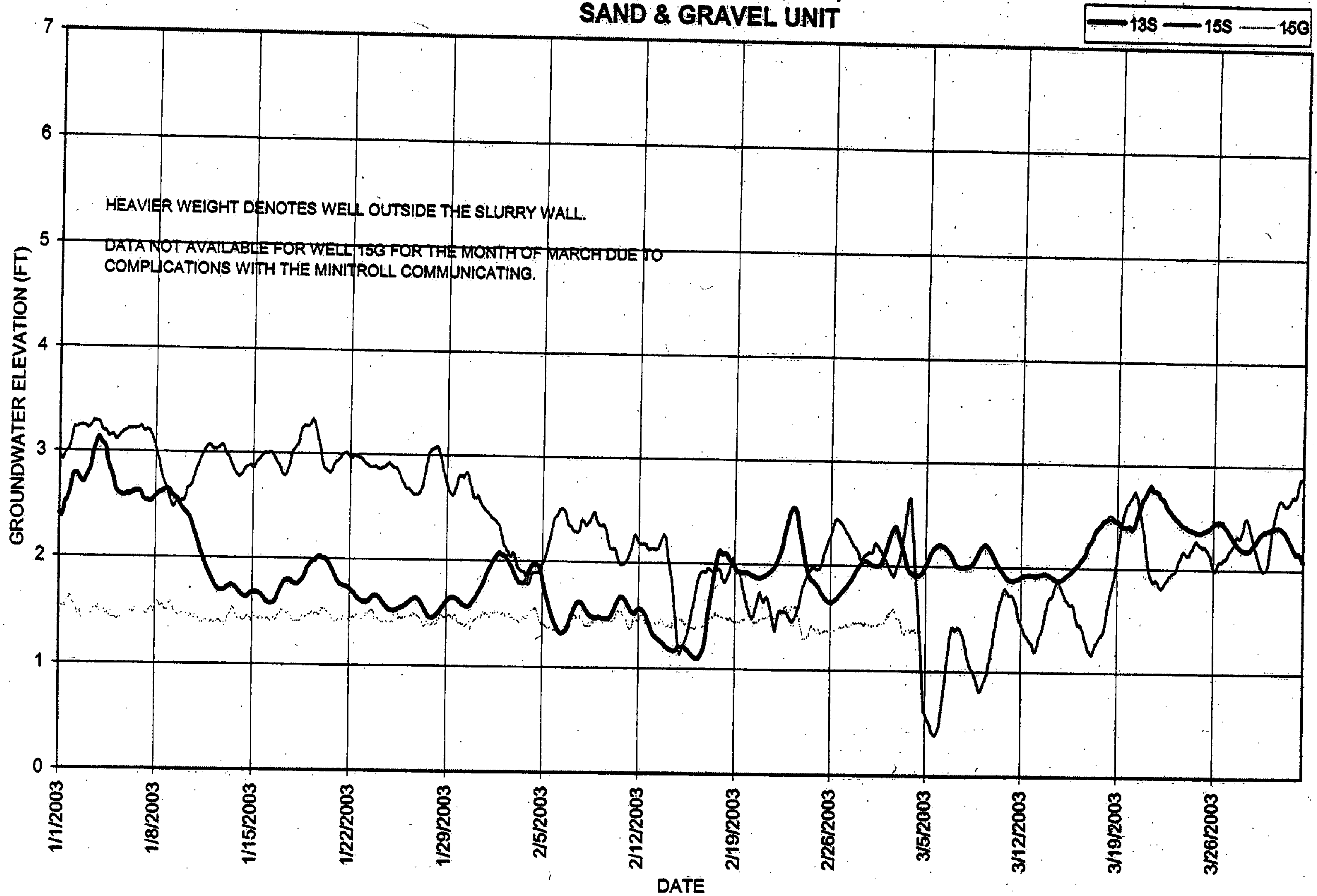

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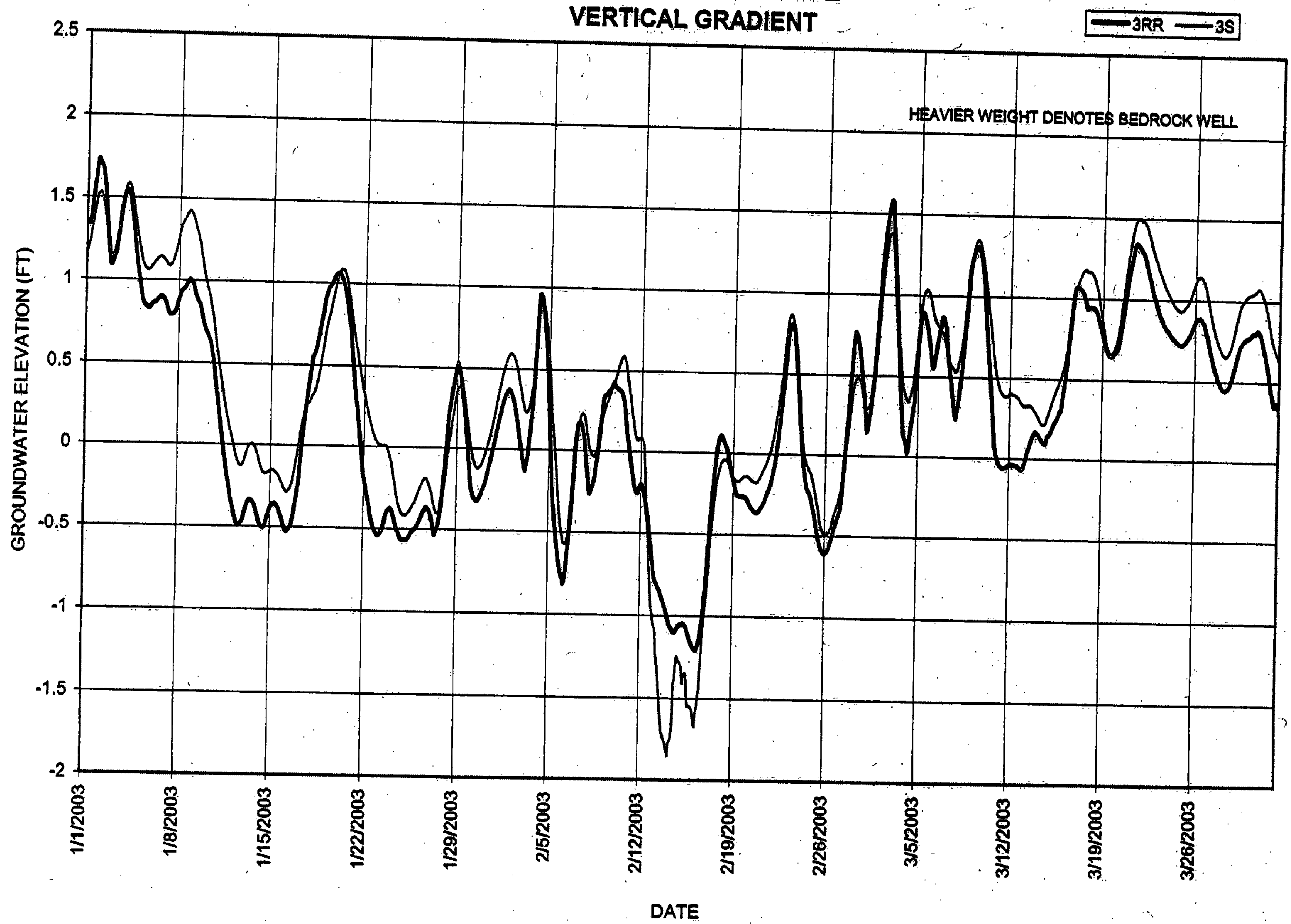
VERTICAL GRADIENT



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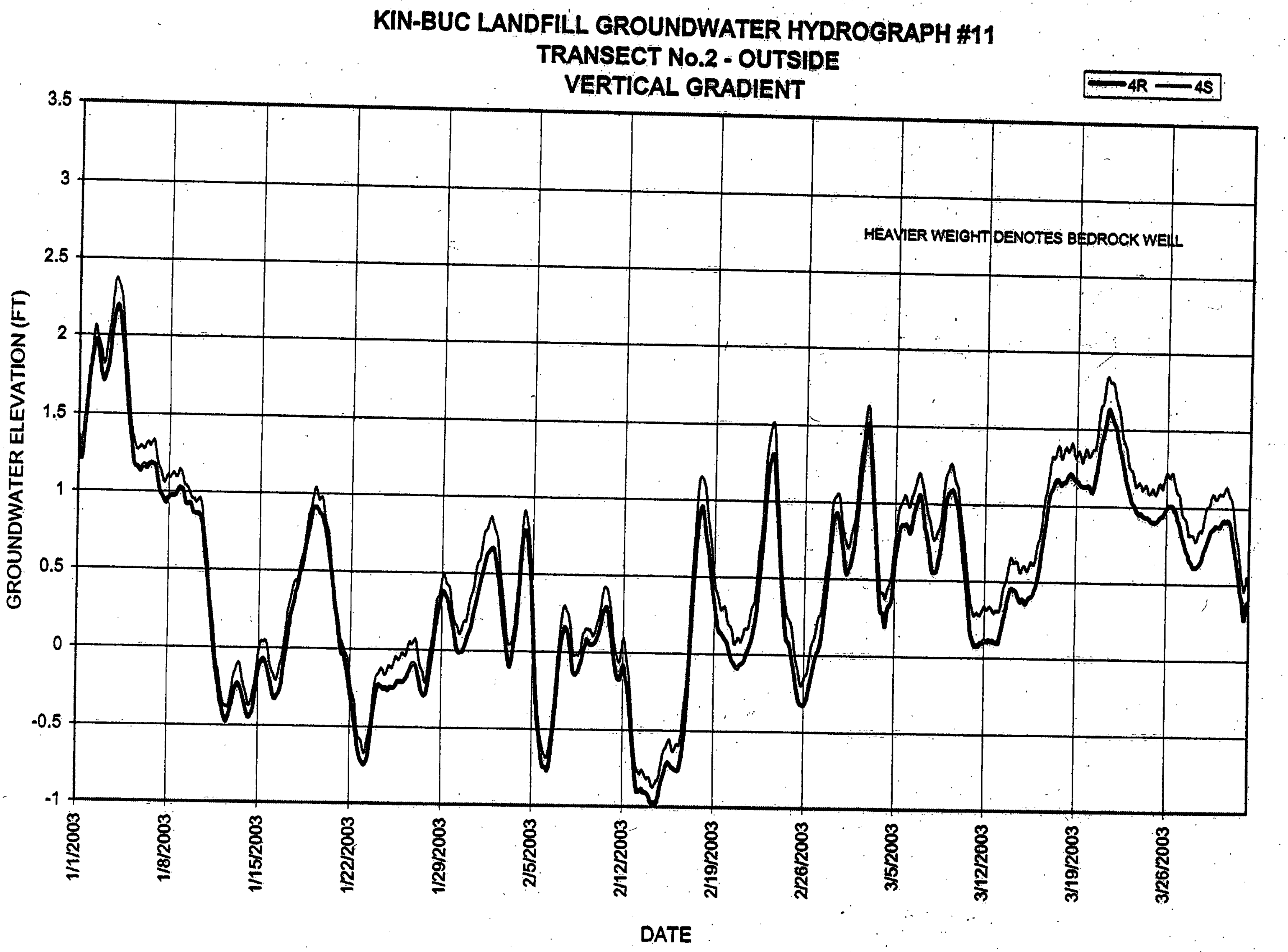

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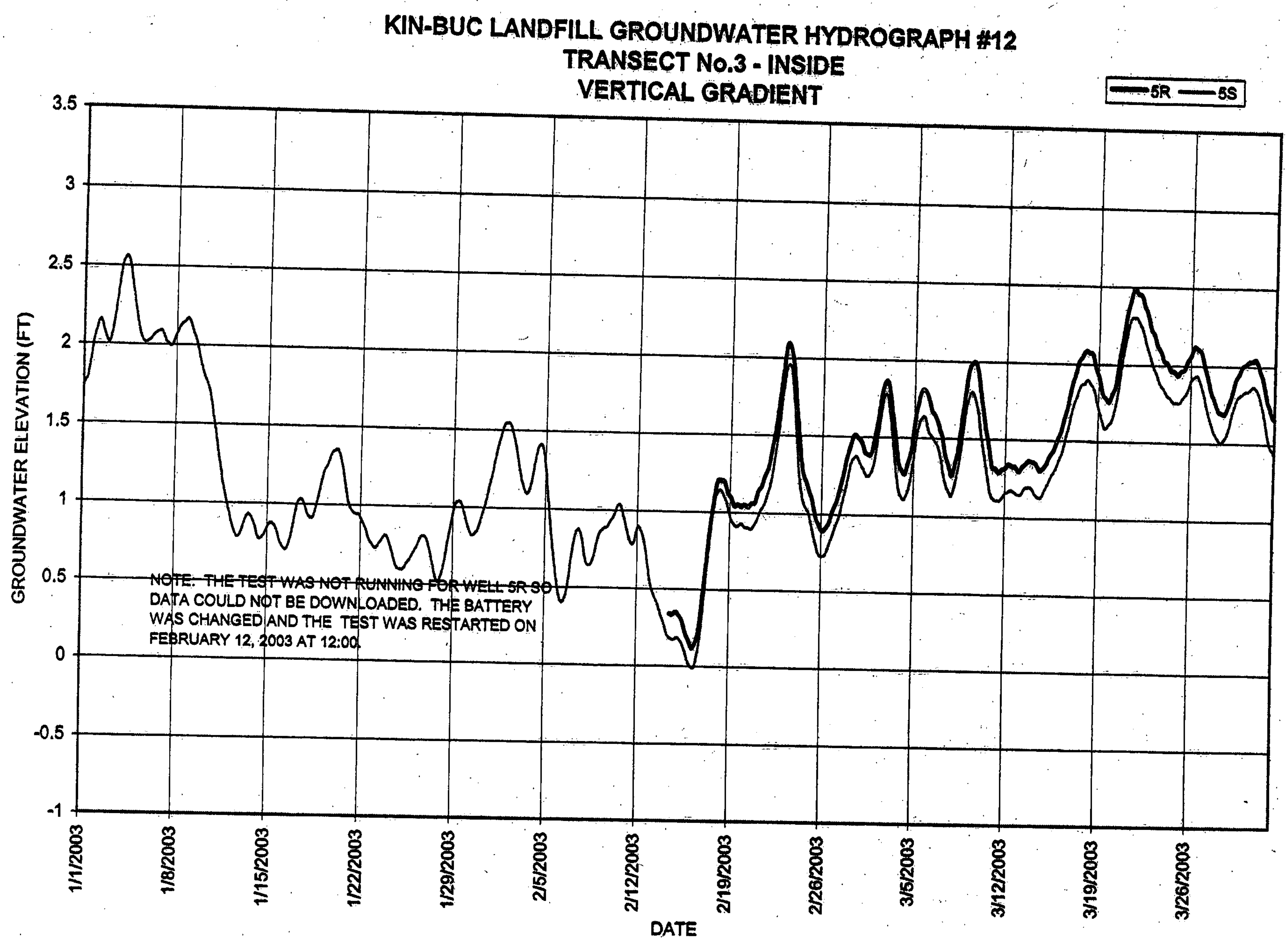

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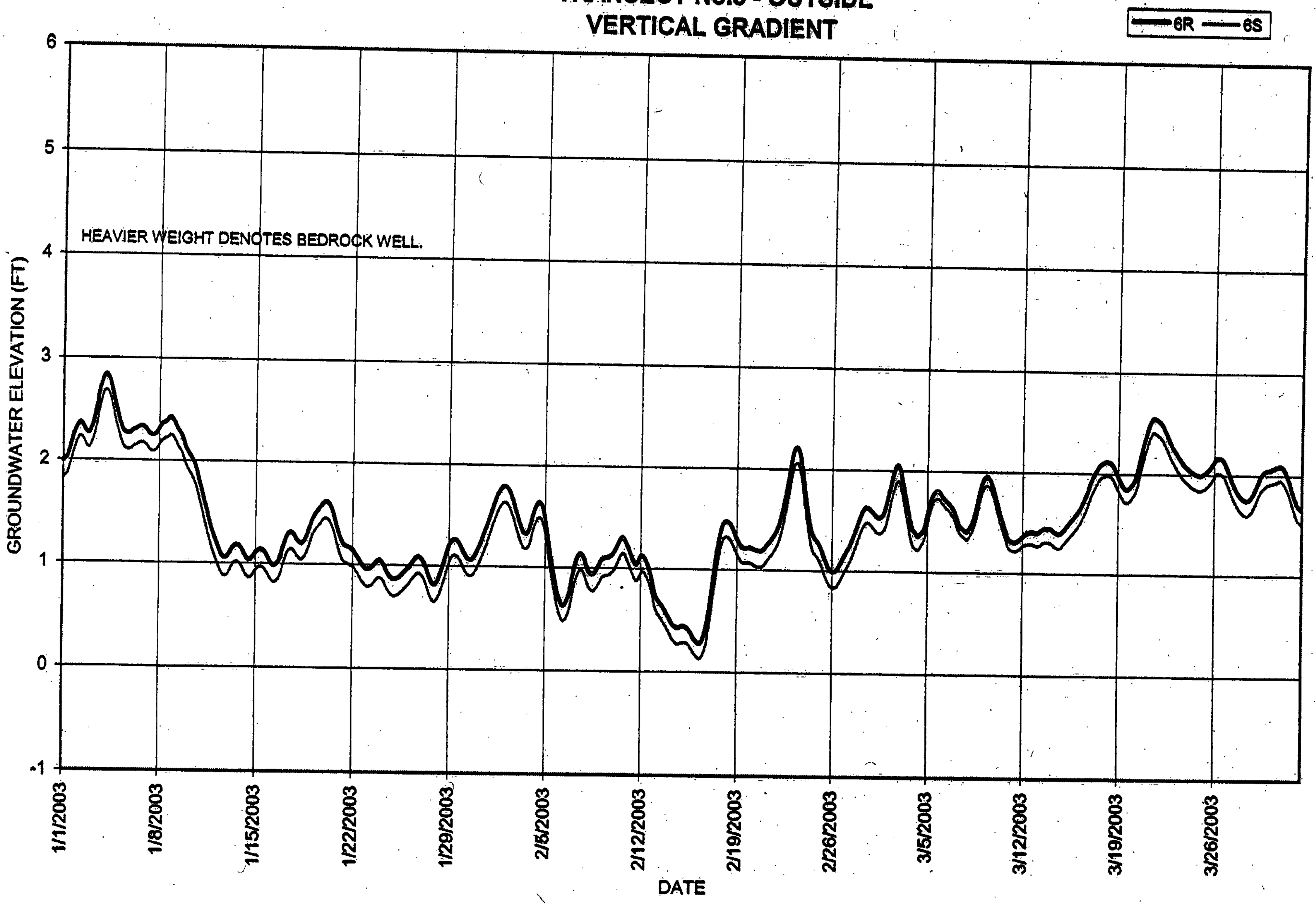
TRANSECT No.3 - OUTSIDE
VERTICAL GRADIENT



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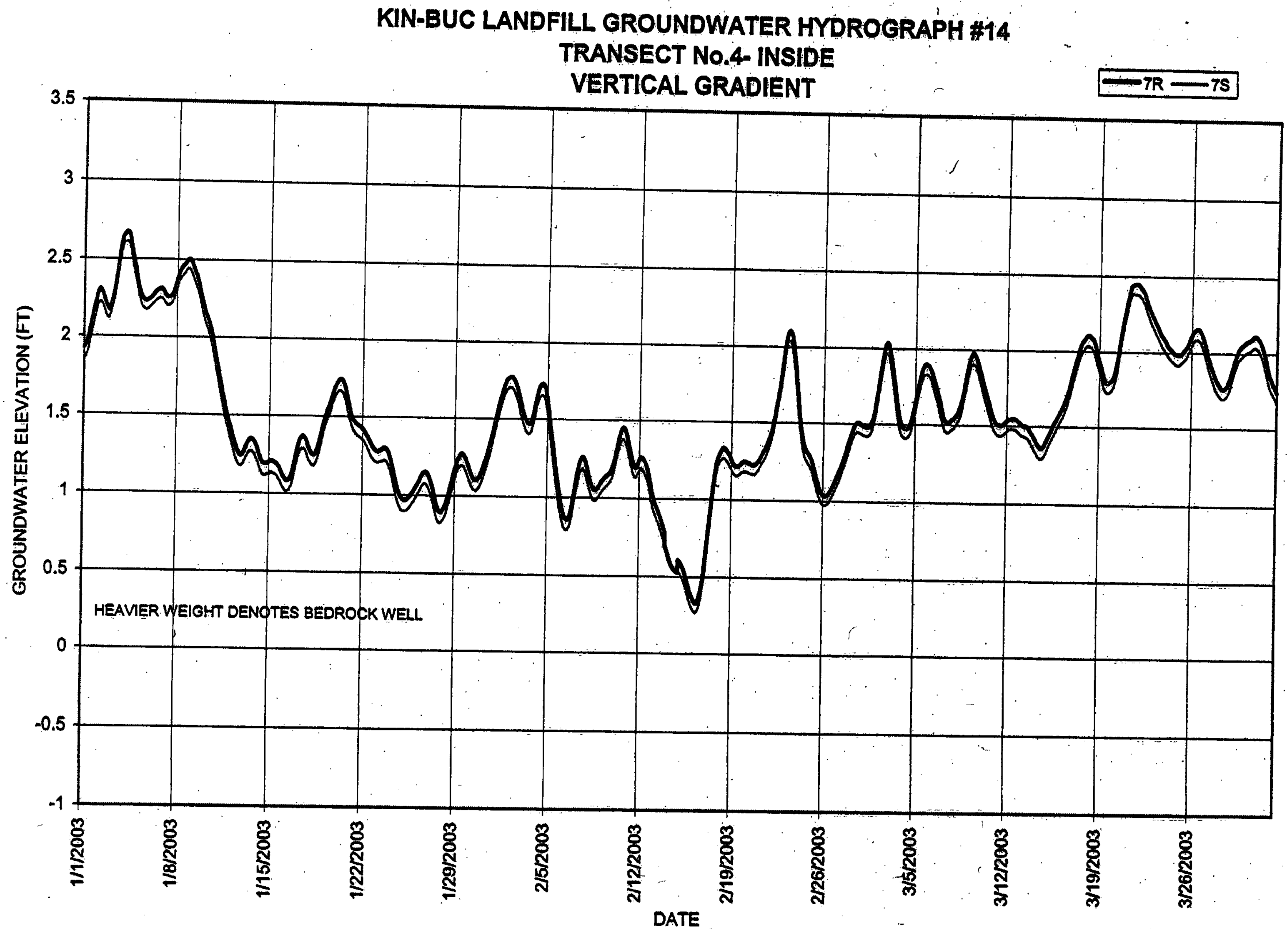

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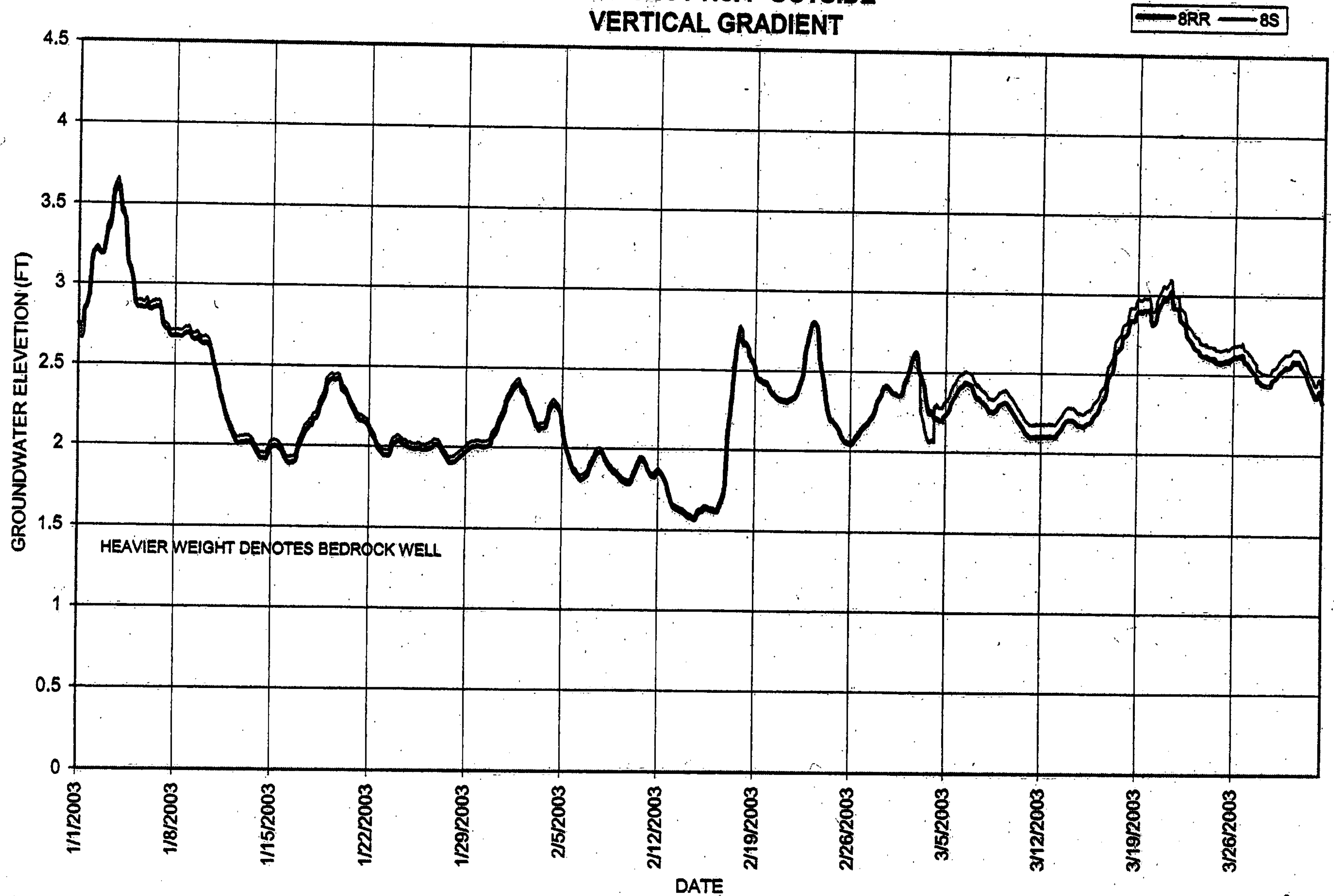

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ATTACHMENT 2

IT Corporation
Crossroads Corporate Center
One International Boulevard, Suite 700
Mahwah, NJ 07495-0086
Tel. 201.512.5700
Fax. 201.512.5786
A Member of The IT Group

the IT group

June 27, 2001
Project 796201

Carl Januszkiewicz
Waste Management, Inc
Kin-Buc Landfill Treatment Plant
383 Meadow Road
Edison, NJ 08817

Re: Evaluation of Head Levels at Transect 1

Dear Mr. Januszkiewicz:

We have completed an evaluation of the hydraulic characteristics at Transect 1 with specific focus on the lack of intragradient conditions associated with the high water levels in W-1G (inside of the slurry wall) relative to those levels in W-2G (outside of the wall).

While intragradient conditions were evident at the outset of the hydraulic monitoring program in April 1996, these conditions have generally not been maintained. Specifically, based on a review of historical hydrographs, intragradient conditions were evident initially from approximately April to July 1996, and April to June 1997. Thereafter, to more recent events, intragradient conditions have been observed intermittently and for shorter periods of time.

Attachment 1 presents a hydrograph at Transect 1 encompassing the period from September 1998 to December 2000. As seen on the hydrograph, there were periods of time when intragradient conditions were not being maintained.

As opposed to the other "G" series monitoring wells that are located in refuse, wells 1G and 2G at Transect 1 are actually located in a silt and clay deposit. Attachment 2 contains the boring logs for these 2 installations. In-situ hydraulic conductivity testing performed at Transect 1 indicated permeabilities of 10^{-7} cm/sec and 10^{-5} cm/sec in W-1G and W-2G, respectively. Accordingly, a source of recharge to the overburden soils in the area of W-1G would not readily drain away, and therefore, higher heads could result.

Well 1G sampling events (November 1998, October 1999, October 2000) can be seen on the hydrograph as sharp vertical drops in groundwater levels. Due to the low permeability of the surrounding materials, the groundwater levels required several months to recover. Since the final cover extends 10 feet past the slurry wall, the source of the groundwater that is recharging W-1G is unknown at present.

The hydraulic gradient between W-1G and W-1R is vertically downward which rules out the bedrock as being a source of groundwater recharge. Based on a recent visual inspection of the area around Transect 1, the cap appears to be good condition and there were no signs that the cap integrity has been compromised.

Figure 1 depicts the conceptual model of the hydraulic interrelationship across Transect 1 showing water level measurements that depict the lack of intragradient conditions across the

slurry wall. The head levels in W-2G (outside the slurry wall) are generally at elevation 12 to 13 feet msl with periodic and short term increases to about 15 feet msl. The water level in the well sometimes falls below the level of the transducer. This is characterized by a flat straight line on the hydrographs as shown on Attachment 1. Head levels in W-1G (inside the slurry wall), on the other hand, are often greater with elevations as high as 15 to 16 feet msl being recorded.

It is evident from a review of Figure 1 that the drop in topography outside of the slurry wall toward Mill Brook, coupled with the higher permeability of W-2G relative to W-1G, would promote a more rapid decrease of head levels in the latter. This suggests that intragradient conditions may not be consistently attainable at this transect in any event. This notwithstanding however, and as depicted on Figure 1, it is important to note that the leachate collection system represents a hydraulic sink within the containment system. As such, groundwater in the vicinity of W-1G would drain toward the sink mitigating concerns of outward flow.

The leachate collection line runs parallel to the slurry wall and at its closest point is only about 20 feet away from Transect 1. Several cleanouts are located along the collection line with the closest, Cleanout 16, only about 65 feet from Transect 1. Leachate level measurements obtained from the cleanouts during December 2000 and June 2001 indicate a leachate level of 10 to 11 feet msl along the collection line as shown in Table 1. The leachate levels observed suggest that the leachate collection system is presently operating effectively.

Recommendations

Based on the above, it is recommended that during subsequent monitoring events at the site, measurements of leachate levels in Cleanouts 14 through 16 be recorded to verify that the leachate collection system is operating effectively. If liquid levels in the cleanouts increase above 12 to 13 feet msl, then maintenance of the collection line is recommended. Subsequent reports to EPA should include a discussion of the leachate collection system and its role as serving as a hydraulic sink within the containment system.

We trust you find this information useful. If you have any questions, please do not hesitate to contact us.

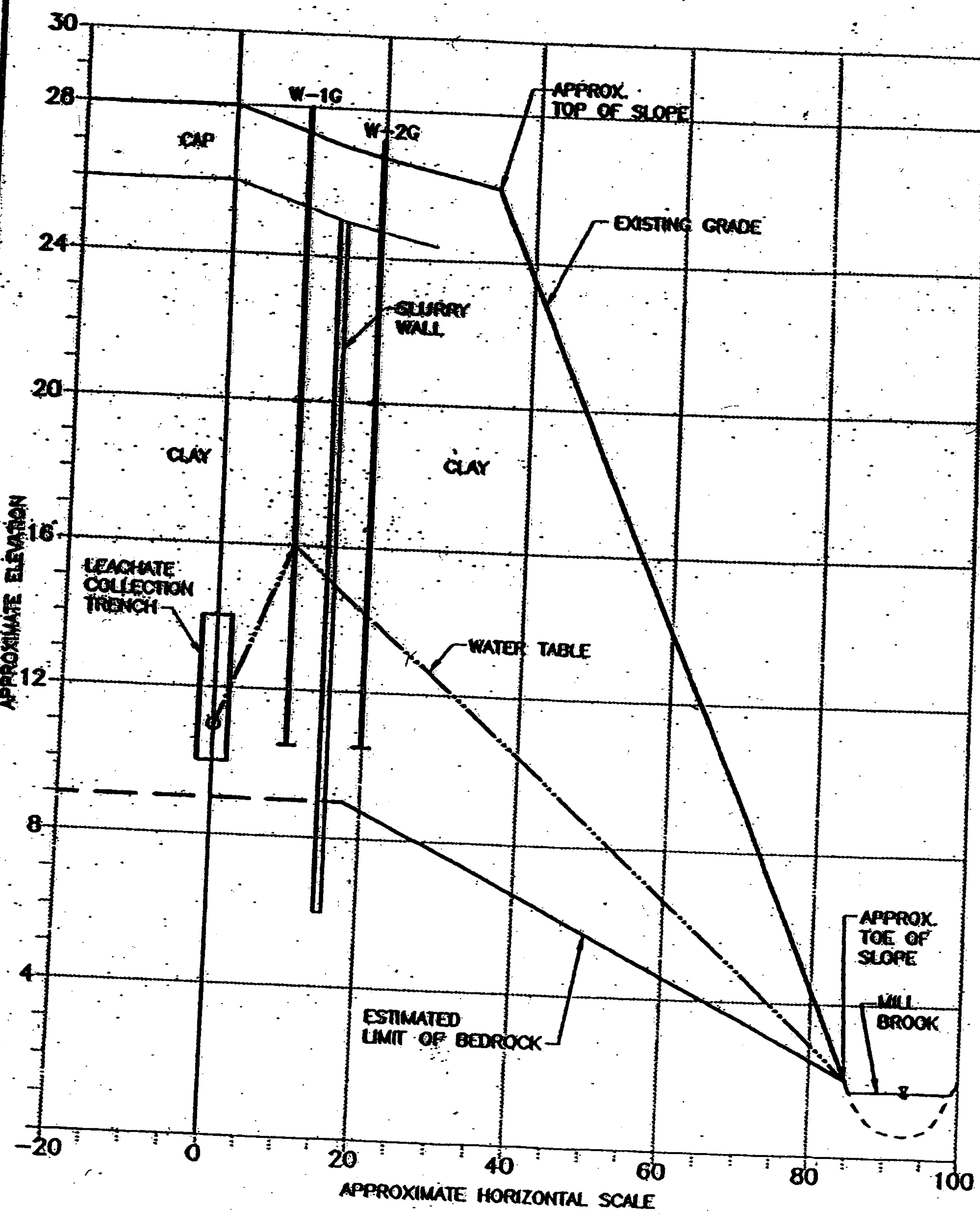
Sincerely,

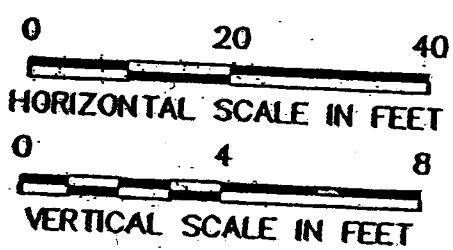
IT Corporation

Steven Goldberg, Ph.D, CPG
Senior Hydrogeologist

Thomas M. Connors, P.E.
Project Manager

Attachments





IT CORPORATION

WASTE MANAGEMENT INC.

FIGURE 1

CROSS SECTION TRANSECT 1

KIN-BUC LANDFILL
EDISON, NEW JERSEY

IMAGE	X-REF	OFFICE	DRAWN BY	CHECKED BY	APPROVED BY	DRAWING NUMBER
			2/2001			796201-A1

[redacted]

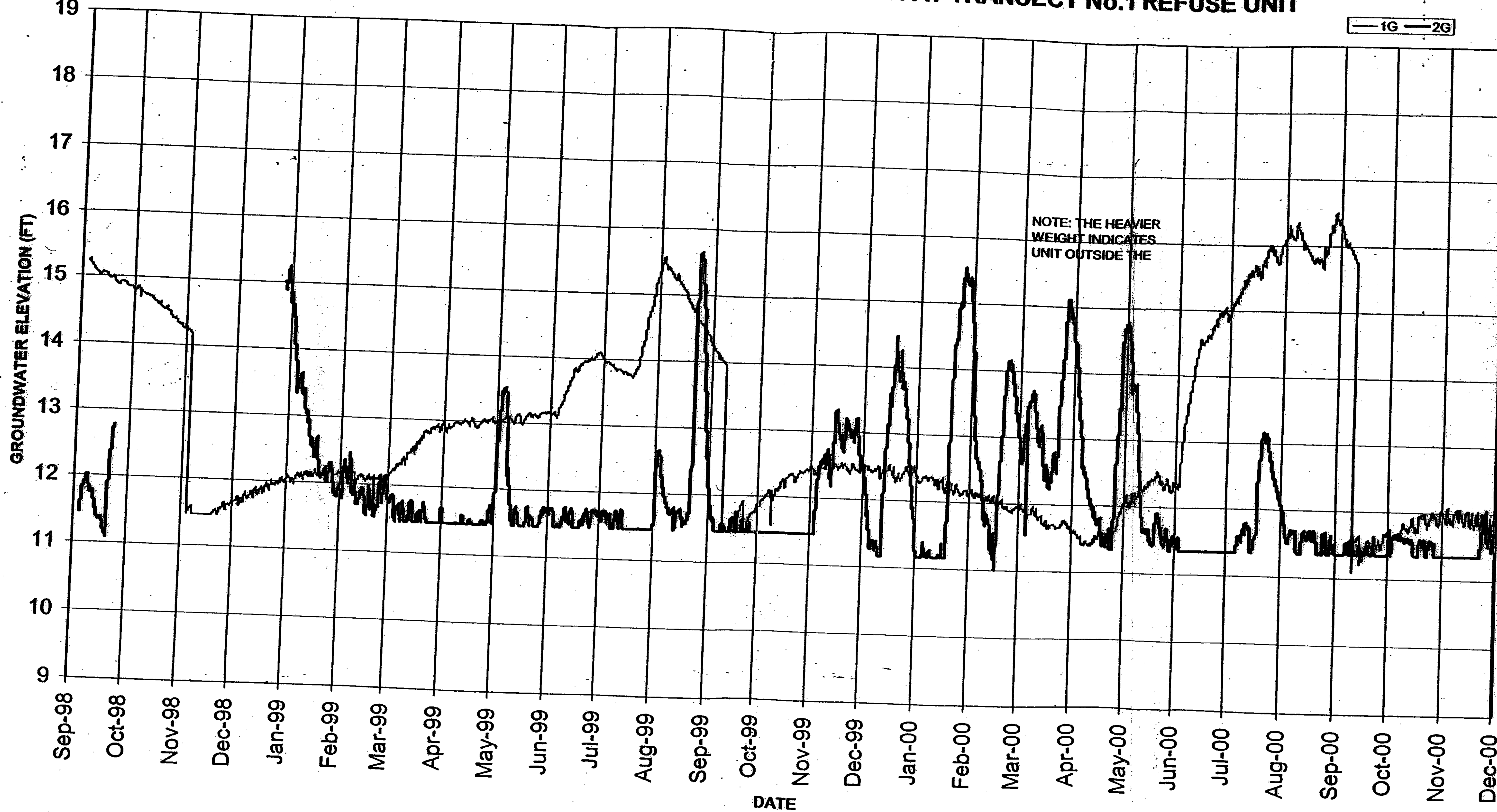
Table 1
Kin-Buc Landfill
Leachate Cleanout Monitoring
2001

Cleanout location	14N		14E		15N		15E		16N		16E	
Elevation @ Sea Level	22.87		22.77		26.51		26.51		31.36		31.32	
	depth to water	elevation	depth to water	elevation	depth to water	elevation	depth to water	elevation	depth to water	elevation	depth to water	elevation
Elevation Average		10.80		10.74		10.66		10.67				11.11
DATE												
6/7/01	11.98	10.89	12.02	10.75	15.86	10.65	15.87	10.64	dry	na	dry	na
5/16/01	12.25	10.62	12.23	10.54	15.96	10.55	15.96	10.55	dry	na	dry	na
4/26/01	12.36	10.51	12.35	10.42	15.99	10.52	16.01	10.50	dry	na	dry	na
3/21/01	11.80	11.07	11.75	11.02	15.62	10.89	15.59	10.92	dry	na	dry	na
2/26/01	12.03	10.84	11.94	10.83	15.95	10.56	15.92	10.59	dry	na	dry	na
1/29/01	12.08	10.79	11.98	10.79	15.85	10.66	15.83	10.68	dry	na	20.41	10.91
12/27/01	12.02	10.85	11.94	10.83	15.72	10.79	15.68	10.83	dry	na	20.01	11.31

N:proj\kinbuc\791186\monthlywaterlevels\cleanout levels.xls

ATTACHMENT 1

KIN-BUC LF GROUNDWATER ELEVATION HYDROGRAPH AT TRANSECT No.1 REFUSE UNIT



n:common\noel\yearKBGW\4 98 - 4 00

ATTACHMENT 2

MONITORING WELL RECORD

Well Permit No. 25 - 46506
Atlas Sheet Coordinates 25 : 45 : 428

OWNER IDENTIFICATION - Owner ~~KIN-BUC INC~~
Address 200 CENTENNIAL AVE.
City PISCATAWAY State NJ Zip Code

WELL LOCATION - If not the same as owner please give address. Owner's Well No. 2C
County ~~MIDDLESEX~~ Municipality ~~EDISON TWP~~
Address 383 Meadows Road, Edison, NJ Lot No. 400 Block No. 3C

TYPE OF WELL (as per Well Permit Categories) ~~MONITORING~~
Regulatory Program Requiring Well CERCLA Date well completed 2 / 15 / 95
CONSULTING FIRM/FIELD SUPERVISOR (if applicable) Case I.D. # NJD049860836
Tele. #

WELL CONSTRUCTION

Total depth drilled 15.6 ft.
Well finished to 15 ft.
Borehole diameter:
Top 8 in.
Bottom 8 in.
Well was finished: [X] above grade [ ] flush mounted
If finished above grade, casing height (stick up) above land surface 4 ft.
Was steel protective casing installed? [ ] Yes [X] No

	Depth to Top (ft.) [From land surface]	Depth to Bottom (ft.)	Diameter (inches)	Type and Material
Inner Casing	+4	5	2	Sch 40 PVC
Outer Casing (Not Protective Casing)				
Screen (Note slot size)	5	15	2	Sch 40 PVC .010
Tail Piece				
Gravel Pack	3	15.6	8	#00 Ricci
Annular Seal/Grout	0	3	8	Bentonite slurry
Method of Grouting	tremie			

Static water level after drilling - ft.
Water level was measured using -
Well was developed for N/A hours at N/A gpm
Method of development N/A
Was permanent pumping equipment installed? [ ] Yes [X] No
Pump capacity N/A gpm
Pump type: N/A
Drilling Method HSA
Drilling Fluid - Type of Rig B-61
Name of Driller Chad Chism
Health and Safety Plan submitted? [ ] Yes [X] No
Level of Protection used on site (circle one) None D C B A
License No. 0013753-001375
Drilling Company HARDIN-HUBER, INC.

GEOLOGIC LOG (Copies of other geologic logs and/or geophysical logs should be attached.)

0 - 15.6	red dry stiff clay, some silt

I certify that I have drilled the above-referenced well in accordance with all well permit requirements and all applicable rules and regulations.

Driller's Signature Chad Chism Date 2/15/95

COPIES: White - DEP Canary - Driller Pink - Owner Goldenrod - Health Dept.

DWR-138 M
11/94

NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF WATER ALLOCATION

MONITORING WELL RECORD

Well Permit No. 25 - 46505
Atlas Sheet Coordinates 25 : 45 : 428

OWNER IDENTIFICATION - Owner KIN-BUC INC
Address 200 CENTENNIAL AVE.
City PISCATAWAY State NJ Zip Code

WELL LOCATION - If not the same as owner please give address. Owner's Well No. 1G
County MIDDLESEX Municipality EDISON TWP
Address 383 Meadows Road, Edison, NJ Lot No. 4[illegible] Block No. 3C

TYPE OF WELL (as per Well Permit Categories) MONITORING
Regulatory Program Requiring Well CERCLA Date well completed 2 / 15 / 95
Case I.D. # NJD049860836
CONSULTING FIRM/FIELD SUPERVISOR (if applicable) Tele. #

WELL CONSTRUCTION

Total depth drilled 15.6 ft.
Well finished to 15 ft.
Borehole diameter:
Top 8 in.
Bottom 8 in.
Well was finished: [X] above grade [ ] flush mounted
If finished above grade, casing height (stick up) above land surface ft.
Was steel protective casing installed? [ ] Yes [XX] No

	Depth to Top (ft.) [From land surface]	Depth to Bottom (ft.) [From land surface]	Diameter (inches)	Type and Material
Inner Casing	+4	5	2	Sch 40 PVC
Outer Casing (Not Protective Casing)				
Screen (Note slot size)	5	15	2	Sch 40 PVC .020
Tail Piece				
Gravel Pack	3	15.6	8	#2 Ricci
Annular Seal/Grout	0	5	8	Bentonite slurry
Method of Grouting	tremie			

Static water level after drilling - ft.
Water level was measured using -
Well was developed for N/A hours at N/A gpm
Method of development N/A
Was permanent pumping equipment installed? [ ] Yes [X] No
Pump capacity N/A gpm
Pump type: N/A
Drilling Method HSA
Drilling Fluid - Type of Rig B-61
Name of Driller Chad Chism
Health and Safety Plan submitted? [ ] Yes [X] No
Level of Protection used on site (circle one) None D C B A
License No. 0013753-001375
Name of Drilling Company HARDIN-HUBER, INC.

GEOLOGIC LOG (Copies of other geologic logs and/or geophysical logs should be attached.)

0 - 15.6	red gray dry stiff clay, some silt

I certify that I have drilled the above-referenced well in accordance with all well permit requirements and all applicable state rules and regulations.

Driller's Signature Chad Chism Date 2/15/95

COPIES: White - DEP Canary - Driller Pink - Owner Goldenrod - Health Dept.